

TrendReader Standard 2

Reference Guide



2005 ACR Systems Inc.

TrendReader Standard 2

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WELCOME

Congratulations on your purchase of TrendReader Standard 2 software. We are confident that you will find it to be a most valuable and useful tool for your data collection applications.

For important information on how data loggers work and how to use them, read the introductory chapter for the family of the logger that you have. It will give you an overview of how the loggers work and how to configure them for your application. Next, read the chapter that deals specifically with the type of logger you have.

SECTION 1 Introduction

1.1 **Welcome**

Welcome to TrendReader Standard 2, an easy-to-use program for displaying and analyzing data from portable data loggers. The first part of the guide explains how to use TrendReader Standard 2 software while the second part provides information on the portable data loggers.

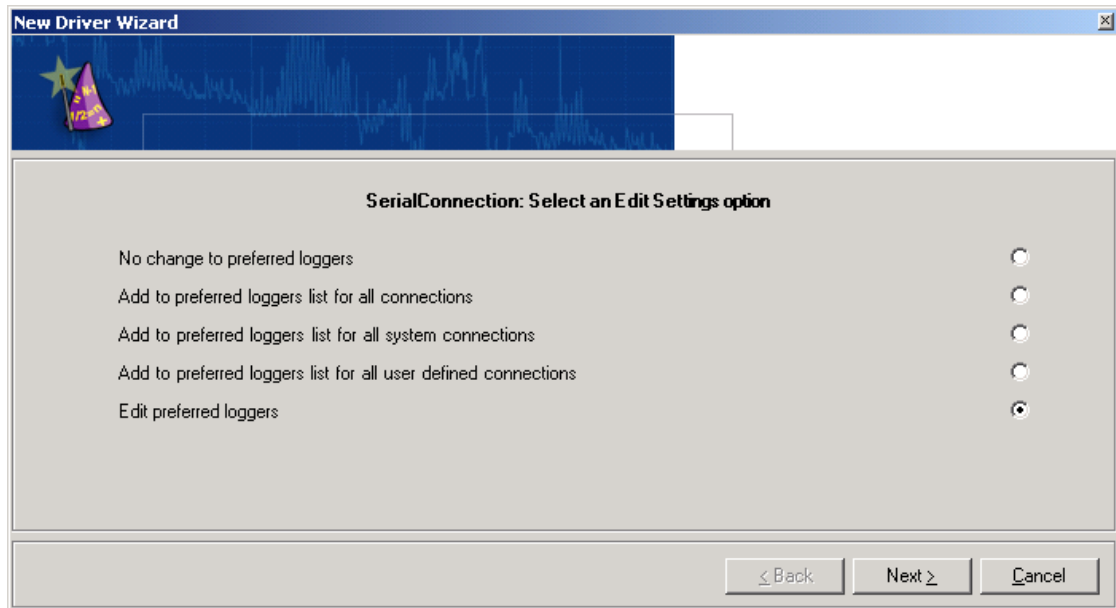
With TrendReader Standard 2 you can:

- Quickly retrieve information from a data logger by connecting the logger to your computer.
- Produce annotated, automatically scaled presentation-quality graphs of your logged data.
- Open data files from different loggers, or from different time periods, within the same graph.
- Retrieve and analyze information from one or more remote data loggers by using a modem.
- Display Realtime -- *as they happen* -- readings from a data logger.
- Transfer logger information to other software packages, for instance, to spreadsheets.
- Write mathematical equations that enable you to interpret your data.

See the Installation section for computer requirements and for instructions on how to install TrendReader Standard 2 software.

1.2 **First Time Run**

After you install the TrendReader Standard 2 the first time or update to a new version when the TrendReader Standard 2 is run the 1st time this screen may appear:



This appears when the new version has new logger drivers to offer. These options will allow you to pre-select the loggers you will be using for your scans. These can also be changed in Preferred Loggers. This is done so that scanning for your connected loggers is faster and more efficient.

No change to preferred loggers

For previous users of TrendReader Standard 2 select the first option to maintain your previous preferred logger settings.

For first time users this option will default the preferred logger settings to all loggers on all connections.

Add to preferred loggers list for all connections

This option will add all newly included logger driver drivers to all connections (system and user defined).

Add to preferred loggers list for all system connections

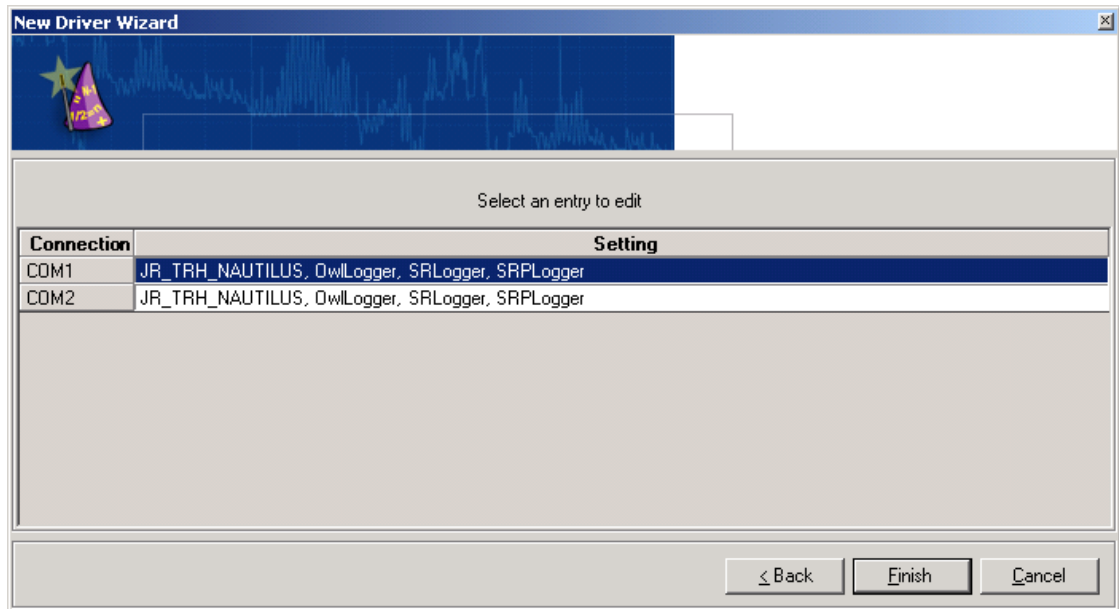
This option will add all newly included logger driver drivers to all hardware connections on your computer.

Add to preferred loggers list for all user defined connections

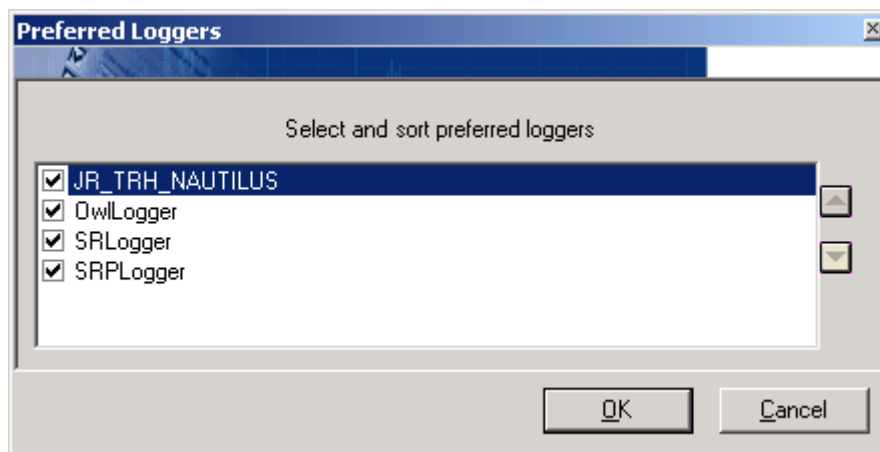
For previous users of TrendReader Standard 2 this option will add all new logger driver drivers to all previously defined connections on your computer.

Edit preferred loggers

This option will take you to the edit screen where you can select which loggers. It is recommended for first time users to edit manually so you can select your logger type(s) for each connection.



To edit the entry click on the setting field of the connection you want to change:



The preferred logger can for the selected connection can be edited in this screen.

1.3 **Registering Your TrendReader Standard 2**

There are two ways to register your TrendReader Standard 2.

1. If you entered your serial number during the installation you can now go to Start | Programs | ACR Datalogger Software | ACR TrendReader Standard 2 | ACR Website | ACR Software Registration Website, or just click [here](#).
2. If you have been using the Trial version when you enter your serial number from the Help menu in TrendReader Standard 2 you will get a message asking you if you want to register now. Clicking Yes will take you directly to the registration website, or just click [here](#).

SECTION 2 For Previous TrendReader Users

2.1 **Introduction to the New TrendReader**

This chapter will help transition users of previous versions of TrendReader software to the new TrendReader Standard 2 software. The [Communication](#), [Loggers](#), [Graphs](#), [Equations](#), [Files](#), and [Options](#) sections illustrate how to perform common operations in TrendReader Standard 2.

The first time you start up your new TrendReader Standard 2 you will see this screen:

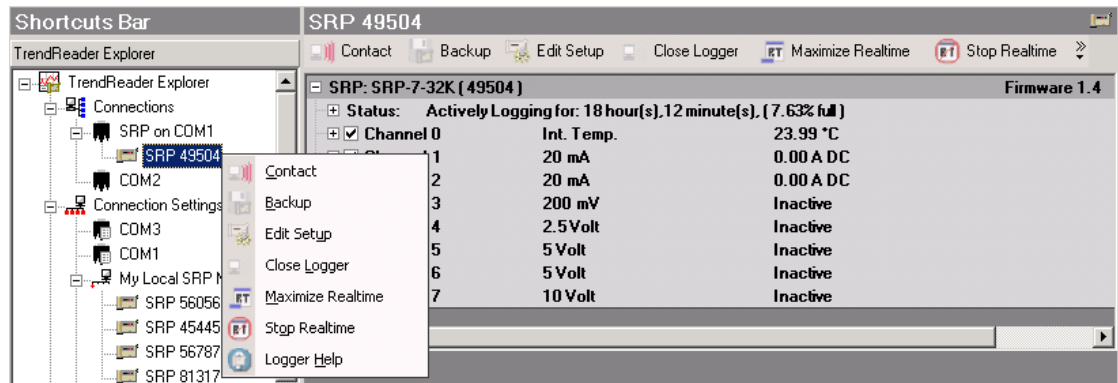
2.2 **Communication**

In TrendReader Standard 2, communication occurs through connections. You no longer open a COM port to contact a logger, instead you scan for loggers based on properties set in the connection setting. If you connect to various types of loggers (SmartReader and SmartReaderPlus for example) on the same COM port, you should create user-defined connection settings, otherwise you can use a system-defined COM connection setting. To learn how to create a connection setting and contact a logger, see Connection.

In previous versions of TrendReader, you set communications parameters such as the baud rate, preferred logger, SRP network, and modem properties through the Communicate Menu. These and other properties are stored in the connection setting. To learn how to set these properties, see Edit Settings.

2.3 Loggers

Once you contact your logger, you will see its status information in the Work Area. A separate logger window does not appear. Instead of buttons for Back Up, Edit Setup, etc., you activate these functions from the Actions Menu, the Work Area, or the menu that appears when you right-click on the logger name. For further information, see Logger.



2.4 **Graphs**

In TrendReader Standard 2, graphs open up in a new window, separate from the main interface window. In the graph window, you can see the graph, data table, and statistics all at the same time. To execute common functions you can use the standard menus, toolbars, or you can also right-click in the graph to bring up menus.

You set your graph properties in Graph Settings, located in the Graph Menu. In addition to standard graph properties, you can change units, disable lines, change equations, and change calibration values in Graph Settings.

When working with comments, you no longer use functions keys or the Format menu. Instead, you right-click in the graph to bring up a menu. See Comments for further information.

In addition to a horizontal zoom, you can now select a box zoom, where you zoom on both axes, or a date and time zoom. See Zoom for further information.

2.5

Equations

TrendReader Standard 2 uses wizards to handle equations. Equations now have an extension of .EQN and are no longer simple text files. To use your existing custom equations, you must Import them first. Also, equations are now associated with a particular logger and channel type. For instance, you cannot use voltage-type equation on a current channel. See Equations for further information.

2.6 **Files**

In TrendReader Standard 2, the default folder where your data files are stored is called the Data Folder and is set from within Preferences.

You can now use long file names for your files. Data logger files now have a .DLF extension and a new format. To convert your existing .TRW and .GPW files, open them from the File Menu and select Save As from the File Menu in the graph window. You can also export the data to different file formats from the File Menu in the graph window.

There is no longer a Revise File function. Instead, you can change equations, calibration values, titles, etc., in the graph itself. You cannot change the sample rate.

2.7 **Options**

In TrendReader Standard 2, options are set using functions available in the Tools Menu. Most options are set using Preferences. To change units for Realtime readings, select Change Units.

SECTION 3 Installation

3.1 **Introduction to Installation**

This guide provides instructions on how to install and remove TrendReader Standard 2.

The minimum requirements for your computer are:

- a Pentium-166 MHz processor
- Windows 2000 or XP
- 200 MB of hard drive space
- 96 MB of RAM
- a CD-ROM drive
- at least 1 communications port: either serial or USB
- a mouse
- Internet Explorer 5.1
- screen resolution 1024 x 768 for optimal viewing results

The recommended minimum requirements for your computer are:

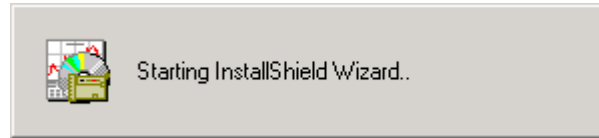
- a Pentium II-350 MHz processor
- Windows 2000 or XP
- 250 MB of hard drive space
- 128 MB of RAM
- a CD-ROM drive
- at least 1 communications port: either serial or USB
- a mouse
- Internet Explorer 6
- screen resolution 1024 x 768 for optimal viewing results

All user accounts on your computer will allow access to TrendReader Standard, however only an administrative user (Standard/Computer administrator) with full access will be able to install the application. Non-administrative users (Restricted user/ Limited) can run the application if they are given read/write access to the application folder: \Program Files\ACR Systems\ACR TrendReader Standard 2. This folder is found on the drive that TrendReader Standard is installed on (usually the C: drive).

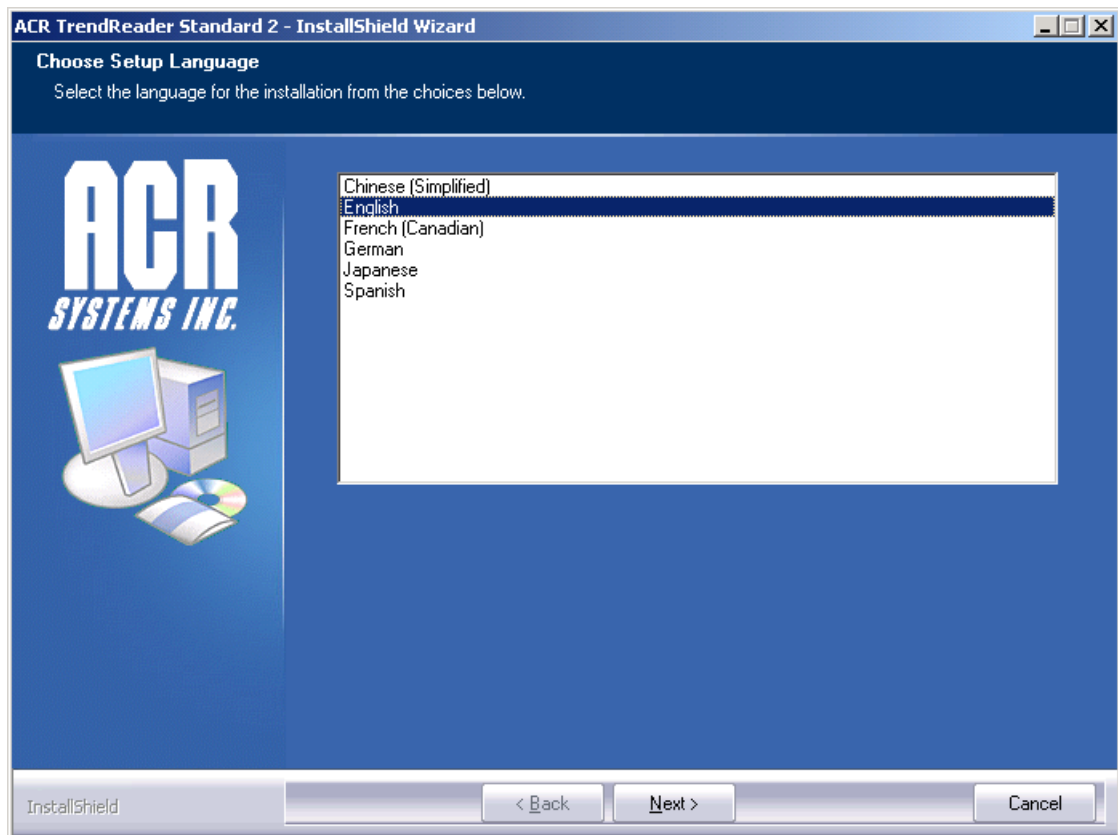
If you do not have permission to the application folder see you network administrator to have your permissions change to allow you to use the application. See also Troubleshooting | Rights.

3.2 Installing TrendReader Standard 2

Before starting the installation, it is recommended that you close all other applications. To install TrendReader Standard 2, insert the Installation CD into the CD drive of your computer. The installation should start immediately, with the following window popping up briefly.

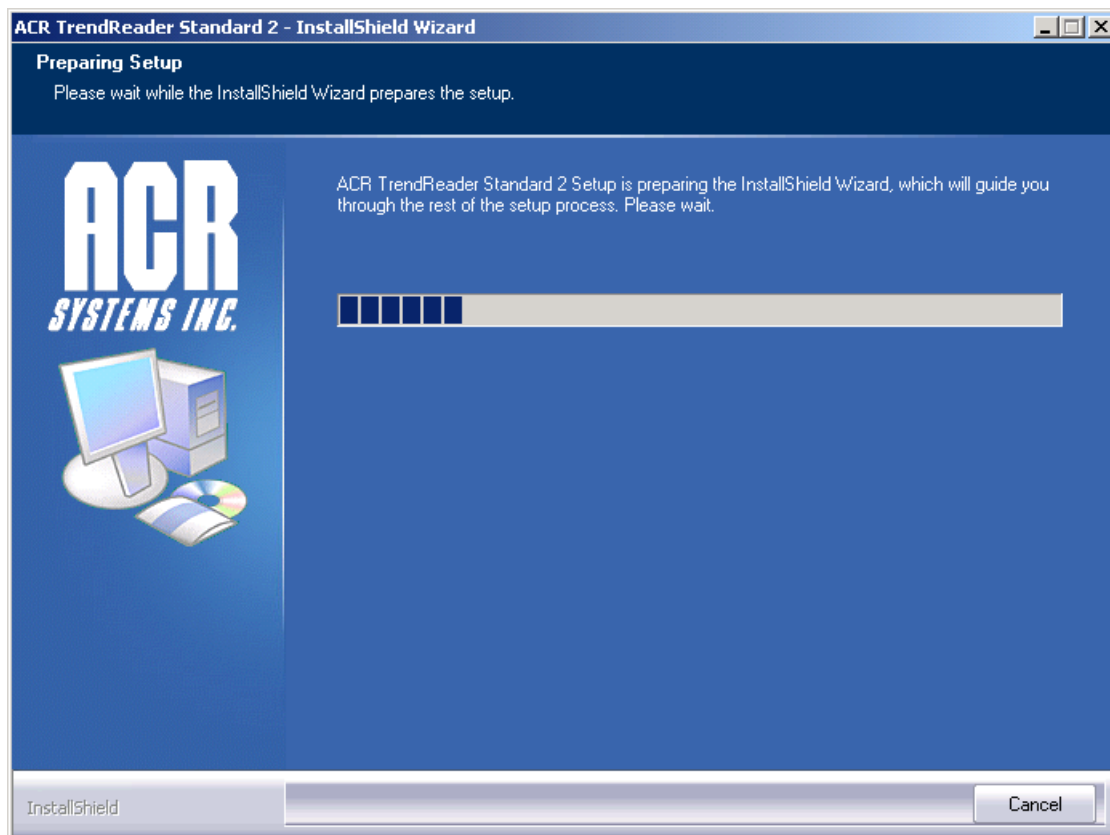


1. A window will appear asking you which language you want to select for the installation (this may not be the language that TrendReader Standard 2 uses). Click on the appropriate language and then click **Next** to continue. Clicking **Cancel** at any time will abort the installation.

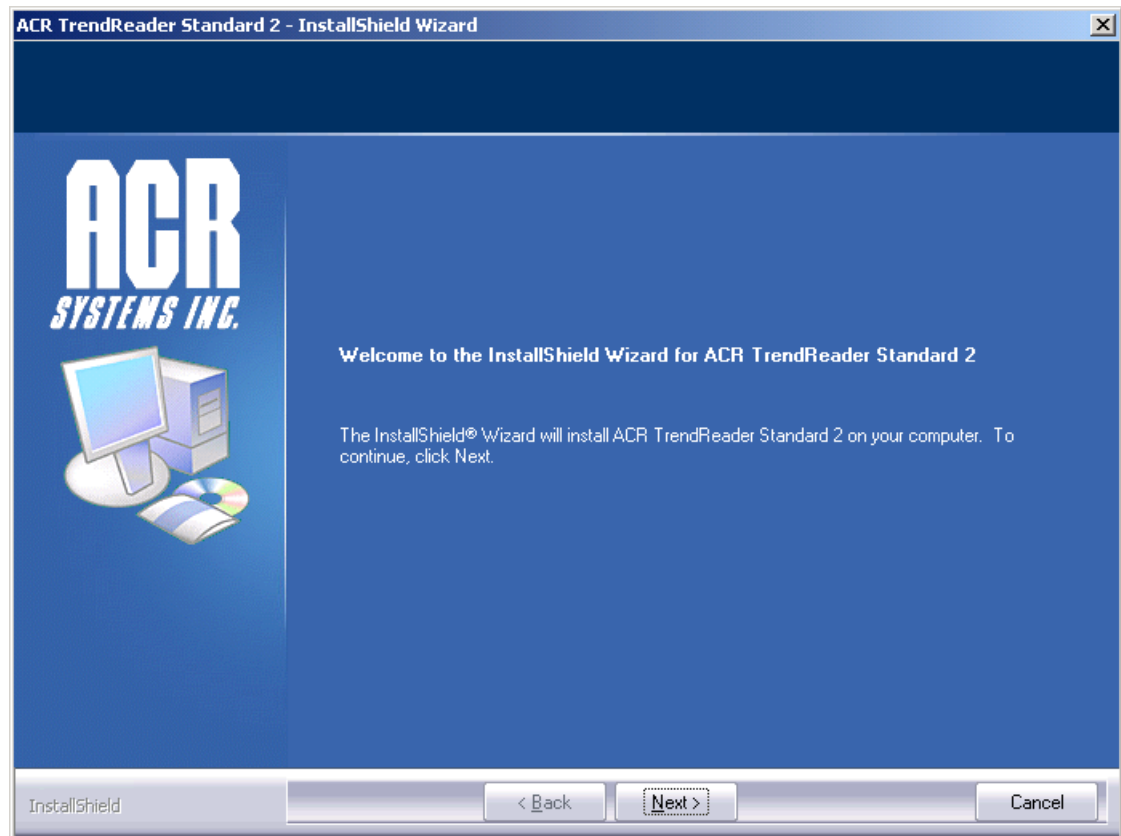


Note that the Chinese (Simplified) will not display in Chinese characters unless you have setup Simplified Chinese in the Regional Settings for your operating system. In Windows XP, Regional and Language Settings, Chinese must also be selected under the Advanced tab to display the Unicode characters. See [How Can I Use TrendReader Standard 2 in Another Language?](#) to change the language for TrendReader Standard 2.

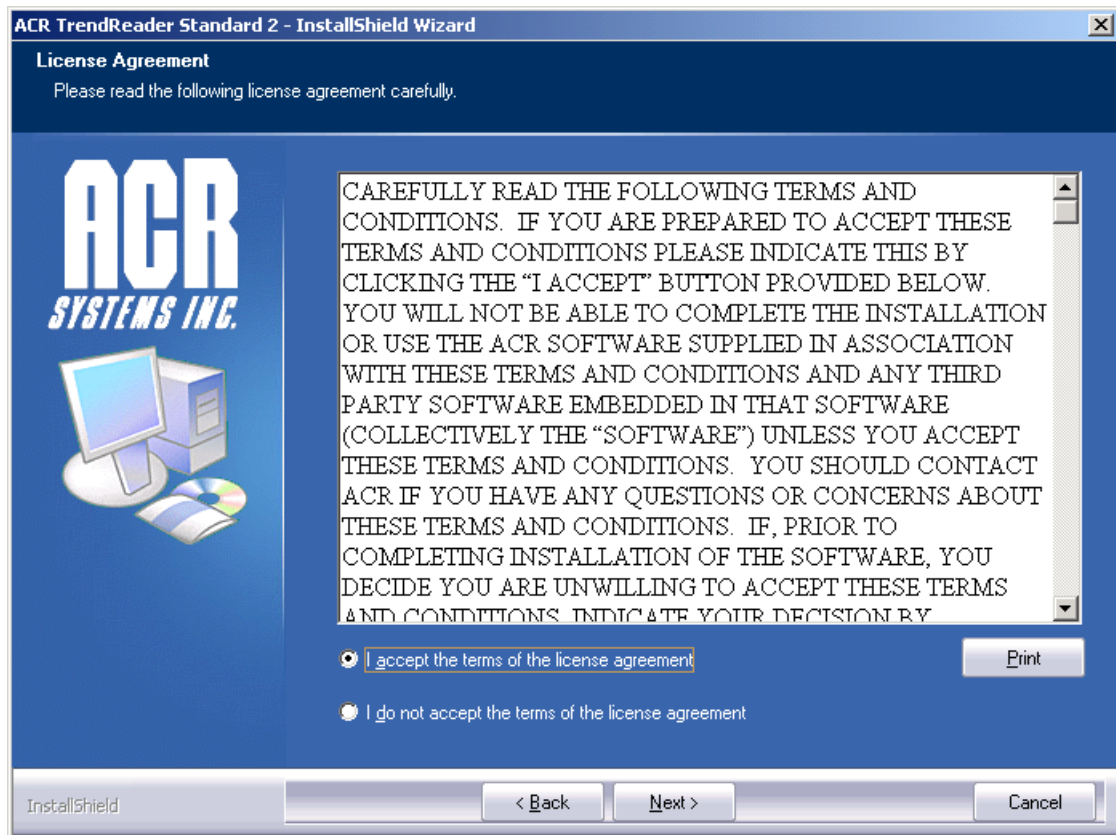
2. A window indicating that the InstallShield Wizard is being prepared is shown briefly and then disappears. No action is required.



3. A window welcoming you to the installation of TrendReader Standard 2 then appears. Click **Next** to continue.



- The license agreement is then shown. Ensure that you thoroughly read the terms and conditions. If you want, click on **Print** to print a copy of the license agreement. Before you can proceed with the installation, you must accept the terms of the license agreement. Click **Next** to continue.



5. In the next screen, enter your User Name, Company Name, and License Serial Number of the software. Enter TRIAL to install the software as a 30-day trial version. Note that the trial version can only be installed once. Click **Next** to continue.

ACR TrendReader Standard 2 - InstallShield Wizard

Customer Information
Please enter your information.

ACR
SYSTEMS INC.

Please enter your name, the name of the company for which you work, and the product serial number.

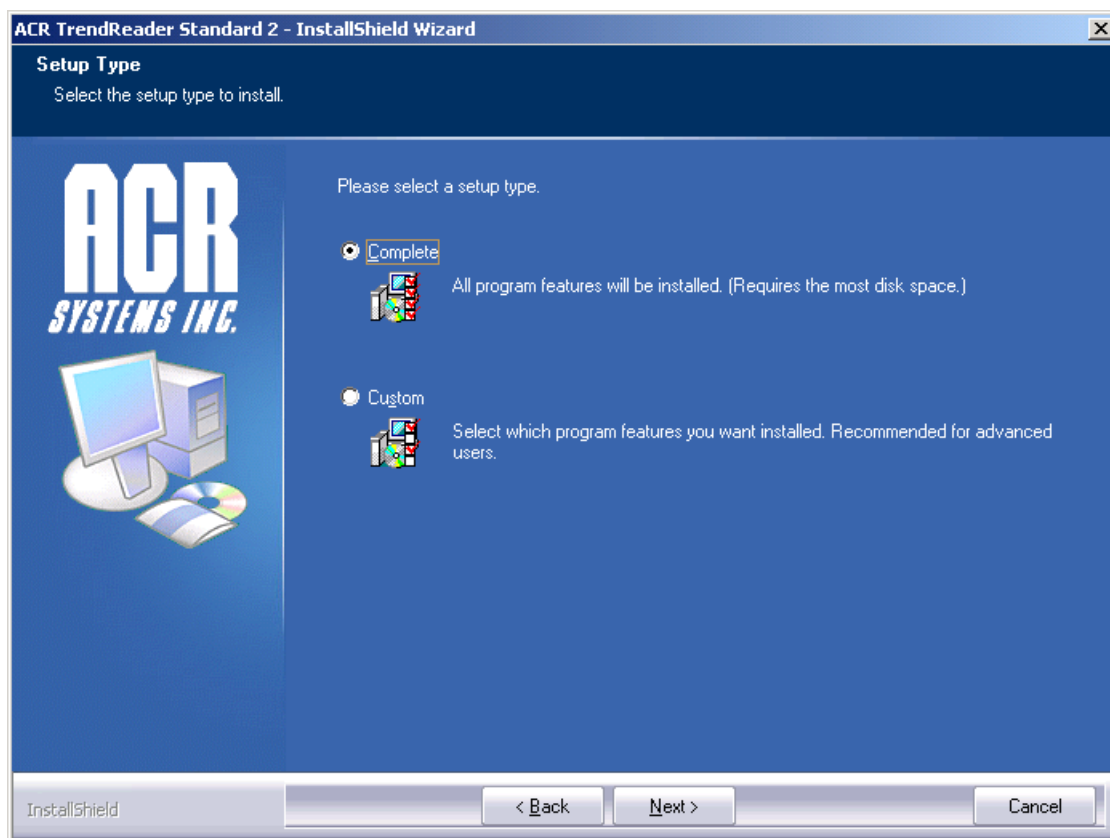
User Name:
User

Company Name:
ABC Company

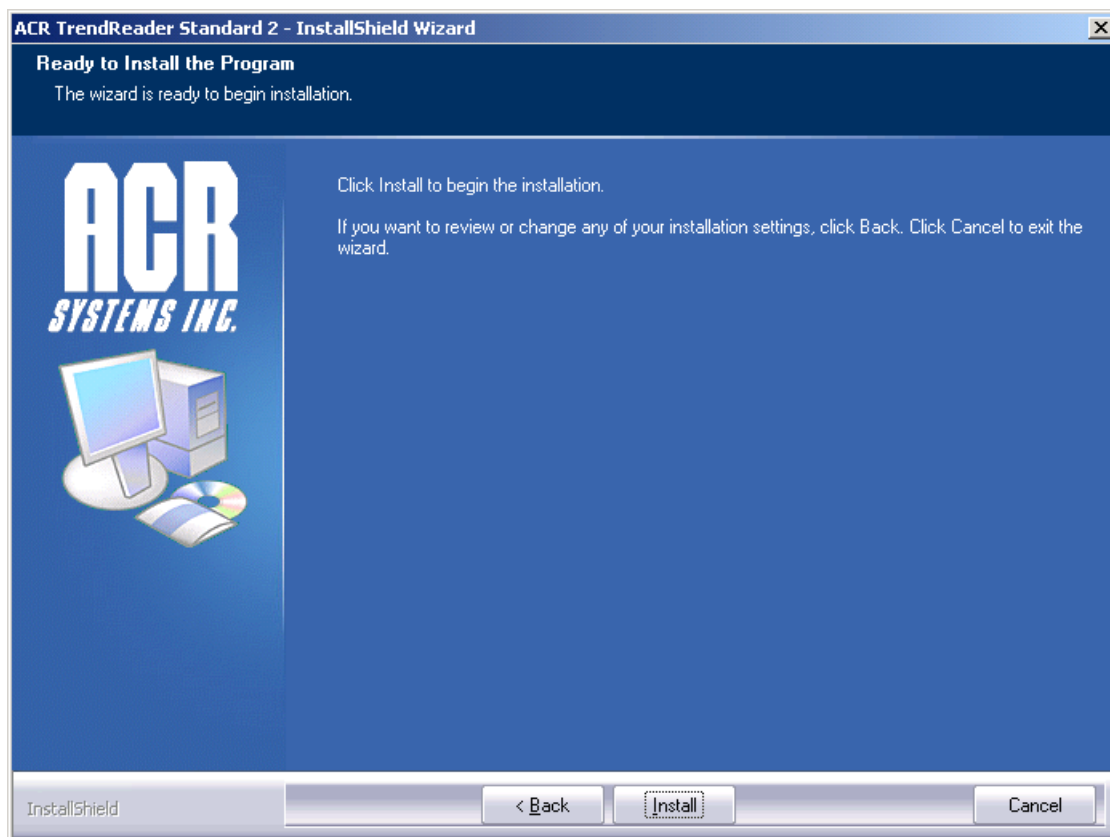
Serial Number:
TRIAL

InstallShield < Back Next > Cancel

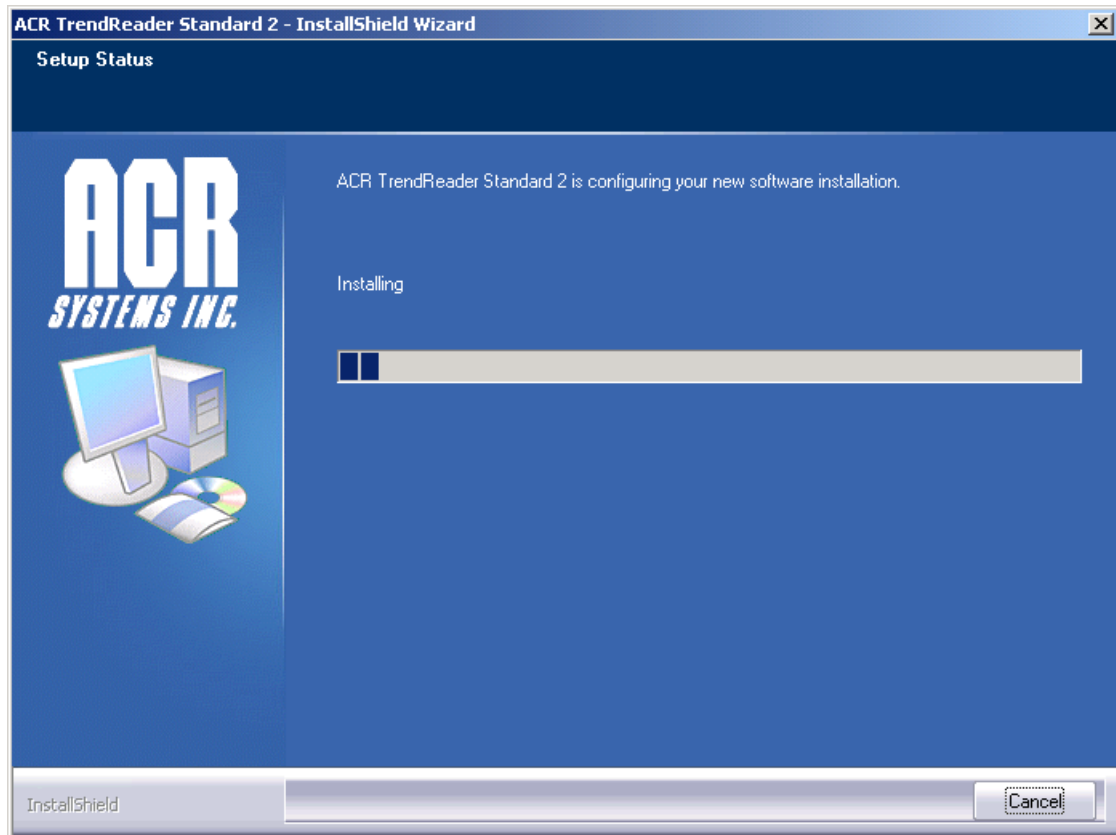
6. In the next screen, you select the setup type. For the initial installation, a Complete setup is recommended. In a Custom setup you can, for example, change the installation directory. Click **Next** to continue.



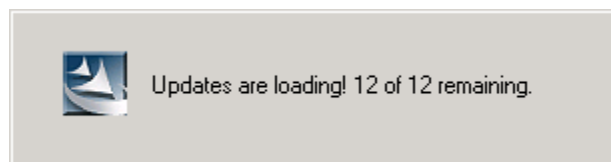
7. The wizard is now ready for installation. Click **Install** to begin the installation.



8. Depending on your computer, the installation may take several minutes.



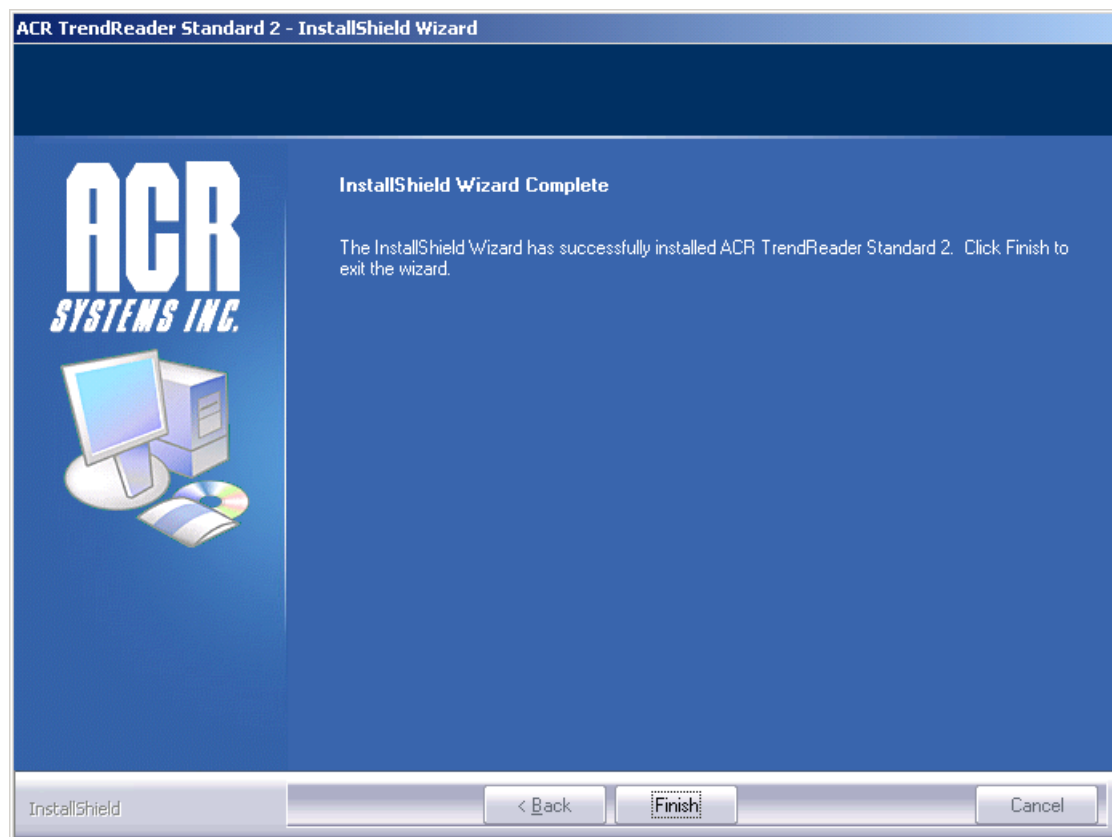
The latest updates will be loaded and the progress is shown on a smaller screen, you may continue to work on other applications while the updates are loading as this may take a few minutes. These updates include logger drivers, languages, and other updates to TrendReader Standard 2.



You will also see the Updater progress bar appear occasionally during the loading of the updates:



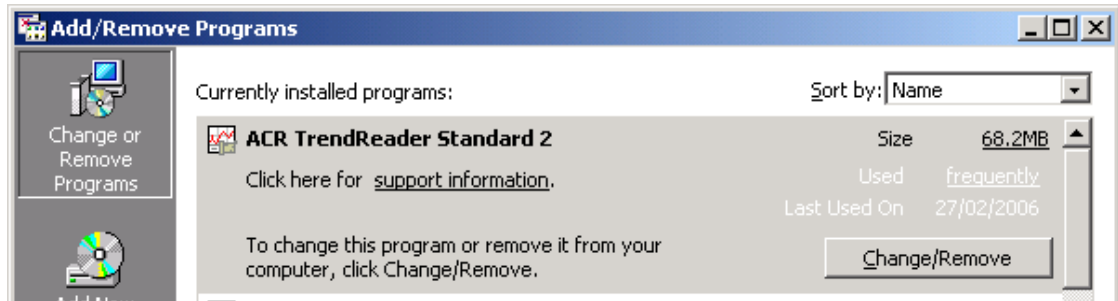
9. Once the installation is complete, click **Finish**.



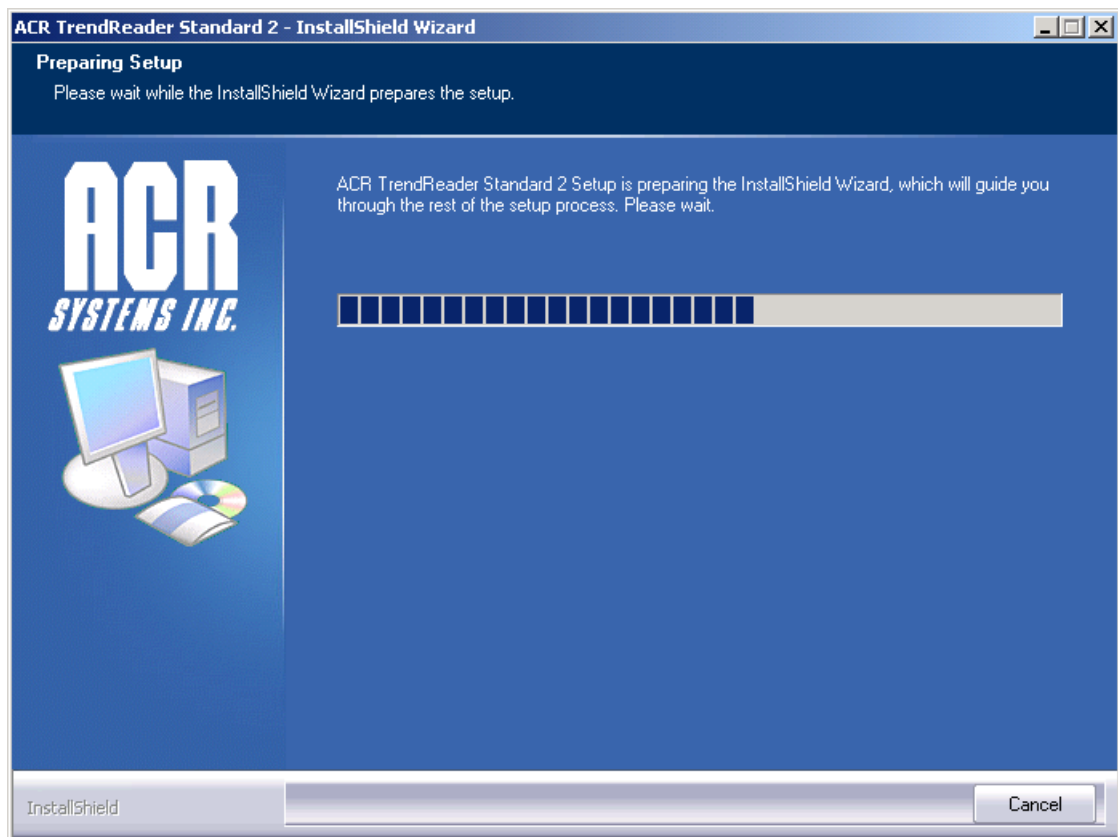
3.3 Removing TrendReader Standard 2

To remove TrendReader Standard 2:

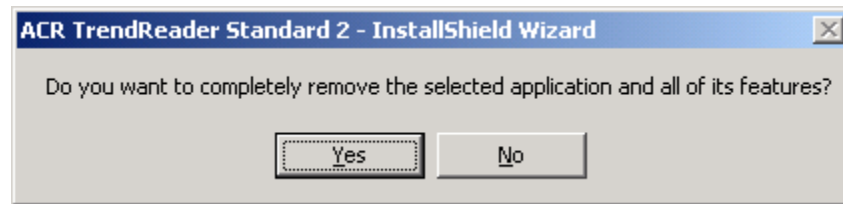
1. From the Start Menu select open the **Control Panel >> Add/Remove Programs**.
2. Select **TrendReader Standard 2** and click **Change/Remove**.



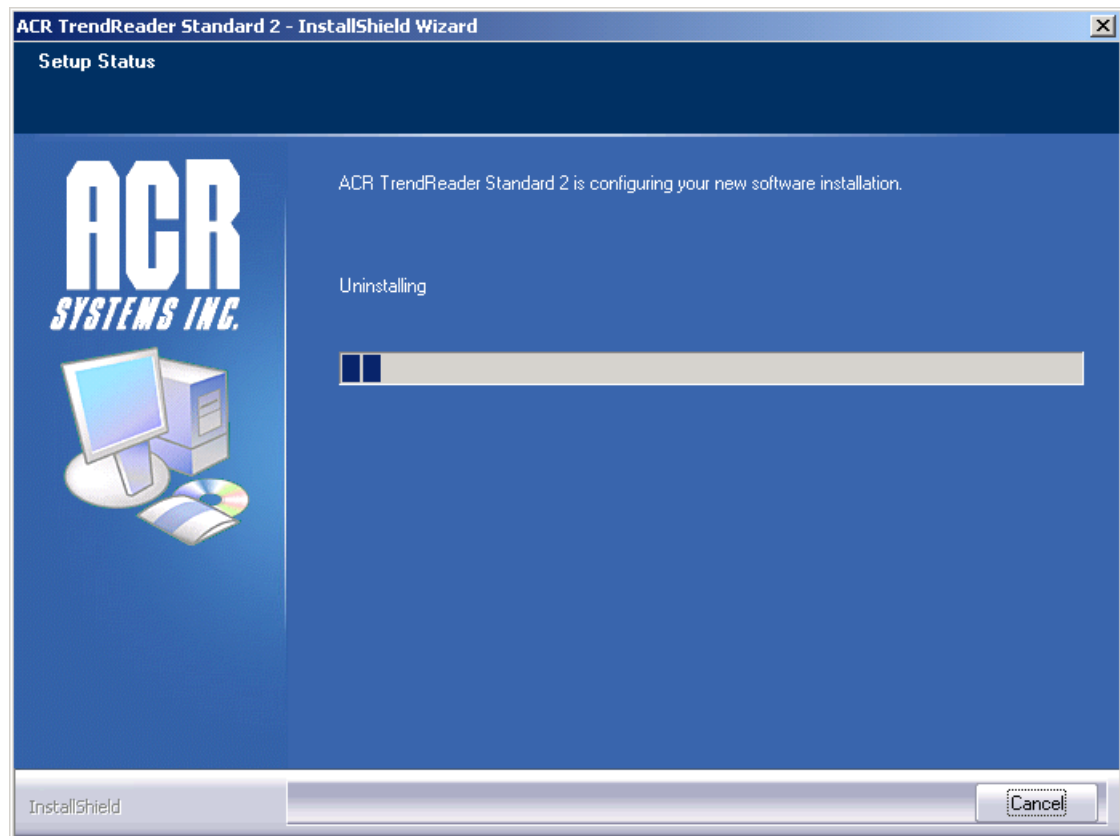
3. A window indicating that the InstallShield Wizard is being prepared is shown briefly and then disappears. No action is required. Clicking **Cancel** at any time will abort the removal. The uninstall will run in the same language that was selected for the install.



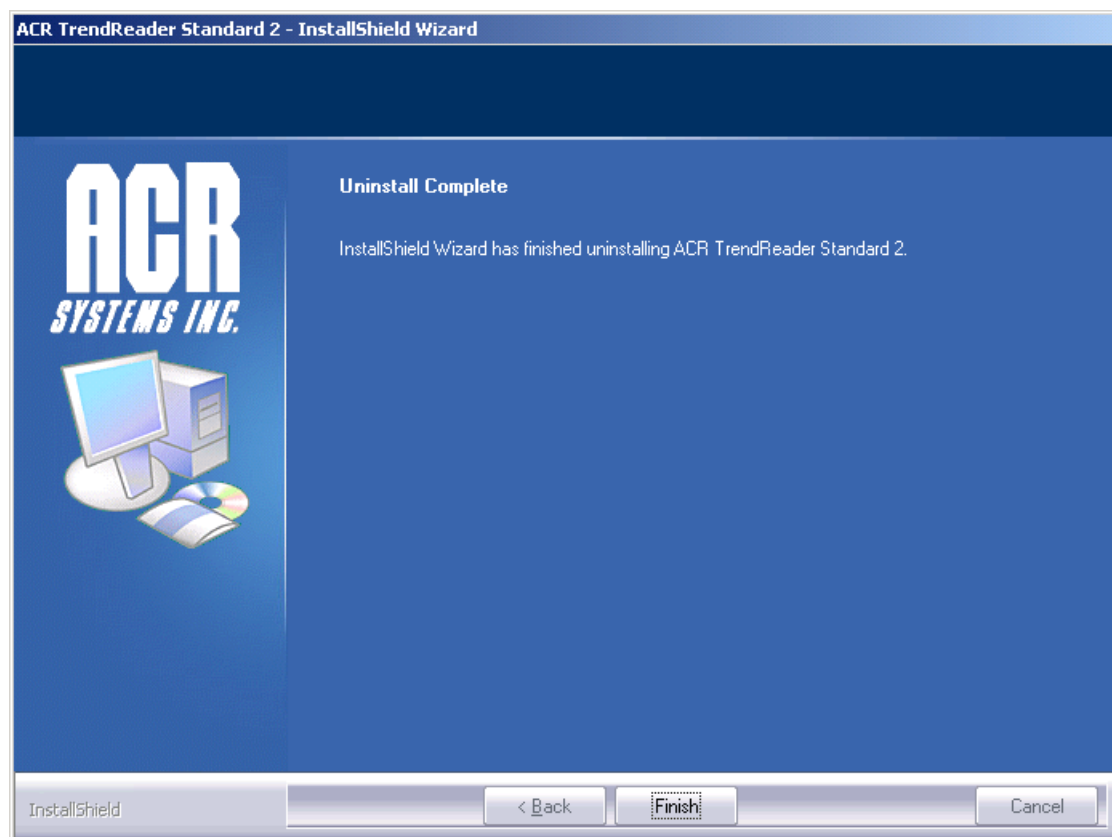
4. A confirmation box is then shown. Click **Yes** to remove TrendReader Standard 2 software. Clicking **No** will abort the removal.



5. A window indicating that the InstallShield Wizard is configuring your installation is shown. No action is required.



6. Next, the window will show that the Uninstall is completed. Click **Finish** to close the wizard.



SECTION 4 Quick Start

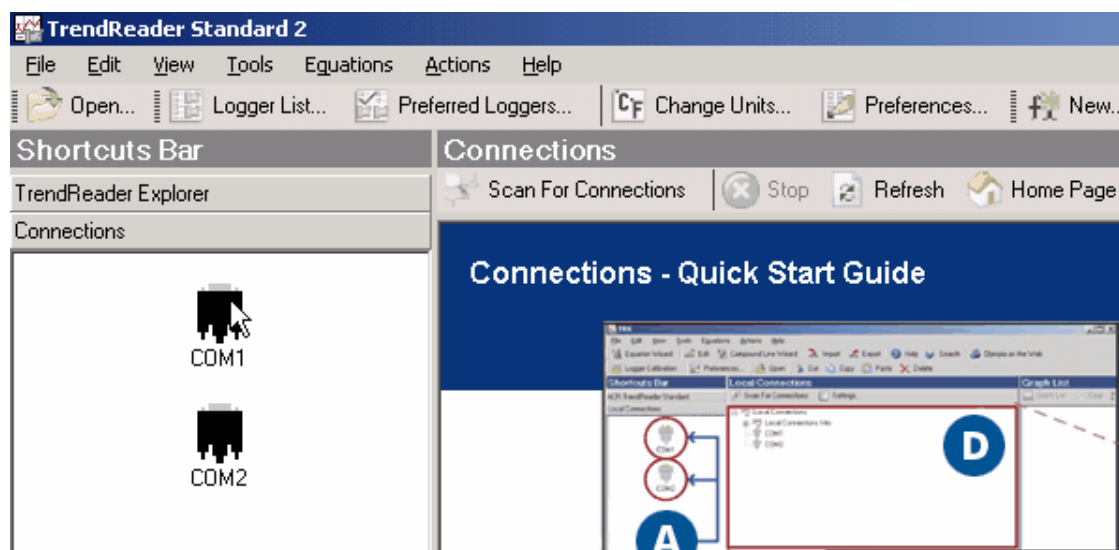
4.1 **Introduction**

Quick Start provides you with a [tutorial](#) showing you how to contact your data logger, set it up, backup the data to your computer, display a graph of the data, and print the graph.

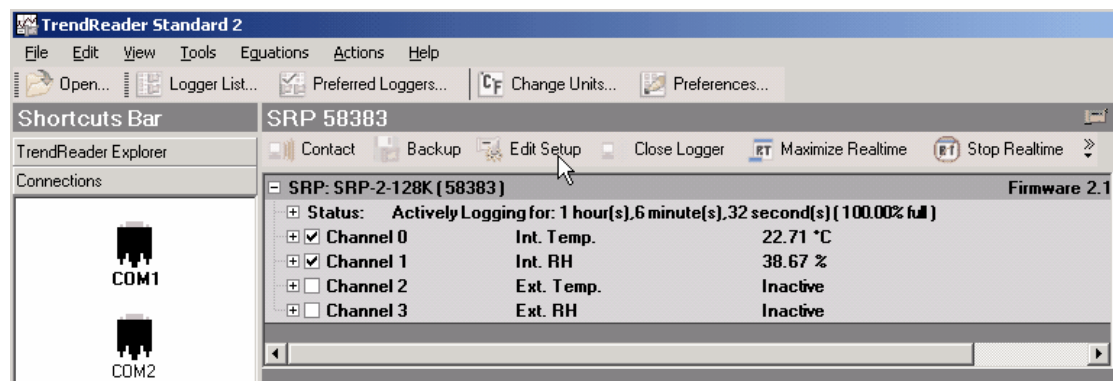
4.2 Tutorial

This tutorial gives you step-by-step instructions on how to perform the essential operations in TrendReader Standard 2.

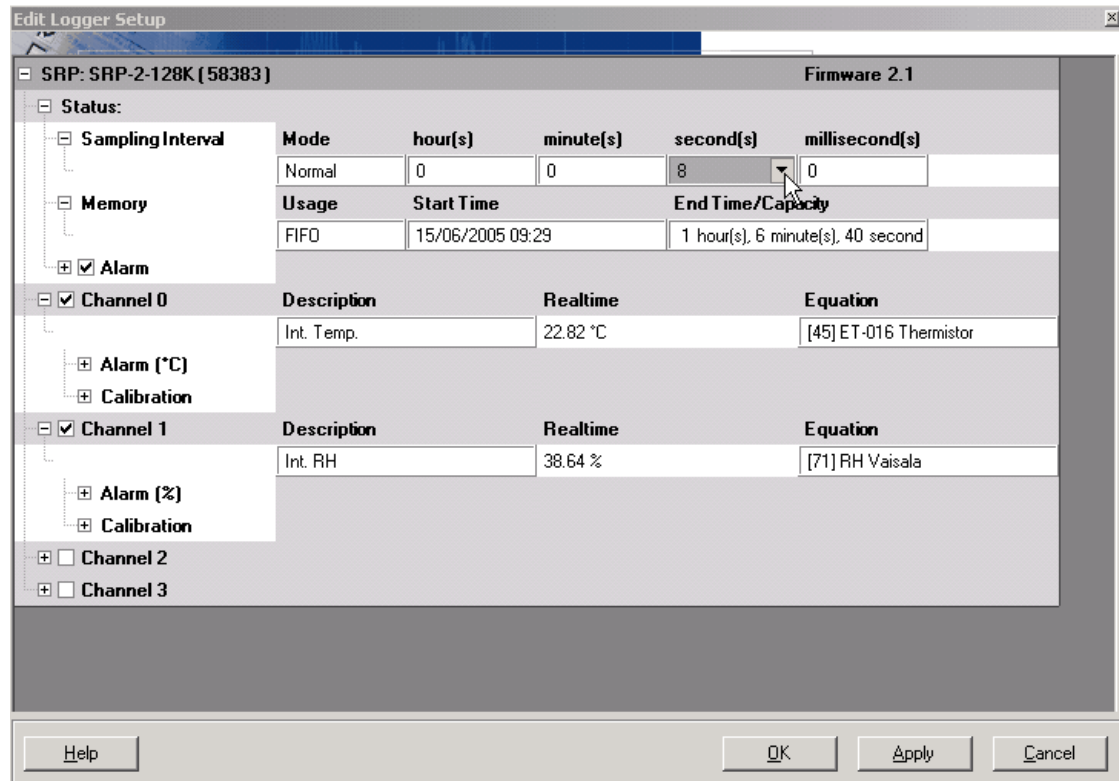
1. Connect your data logger to a communications port on your computer.
2. Double-click the **Connection** icon corresponding to the communications port in order to contact your logger.



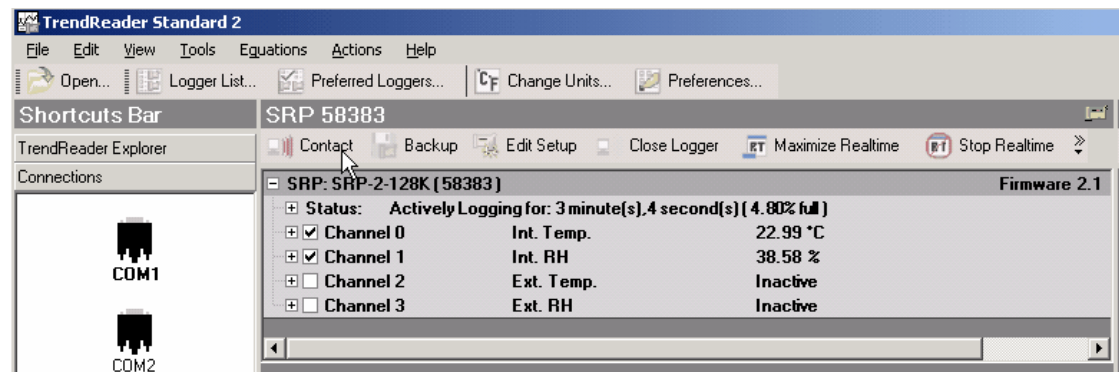
3. Once the logger has been contacted and you see the logger status, click on the **Edit Setup** button to pop up the Edit Logger Setup form.



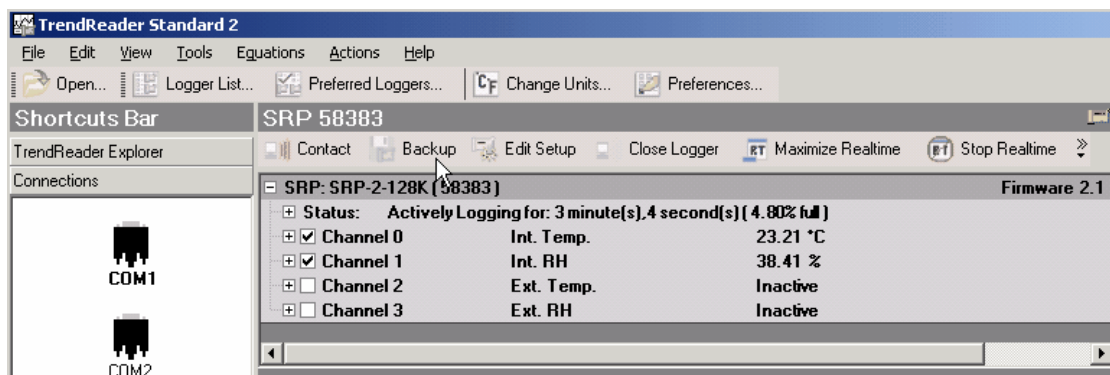
4. Enable the channels that you want to record data with. Set the sample rate to 8 seconds. Click **OK** to setup the logger.



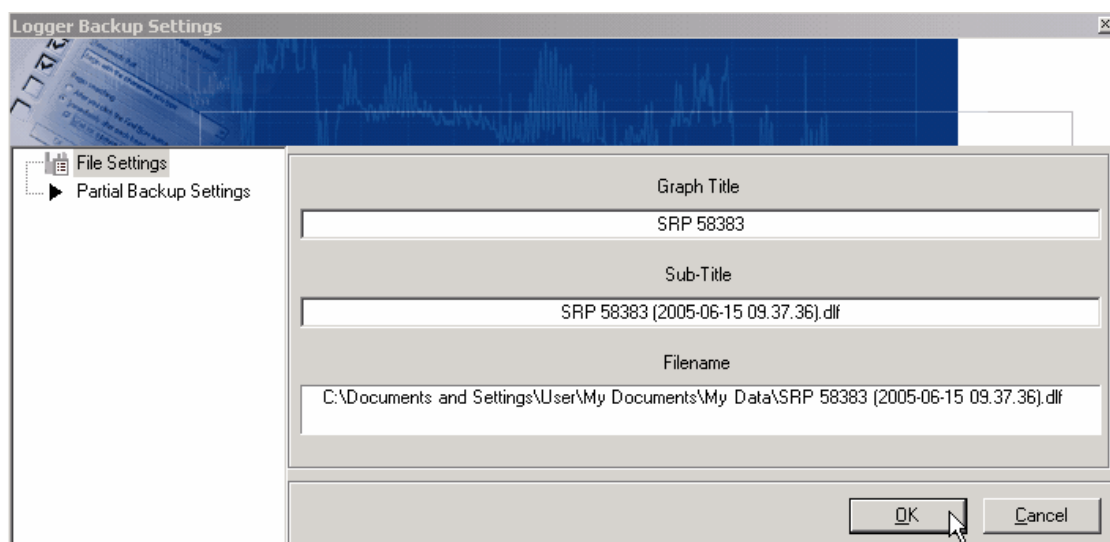
5. Wait a couple of minutes while the logger collects data. Click **Contact** to verify the logger is recording.



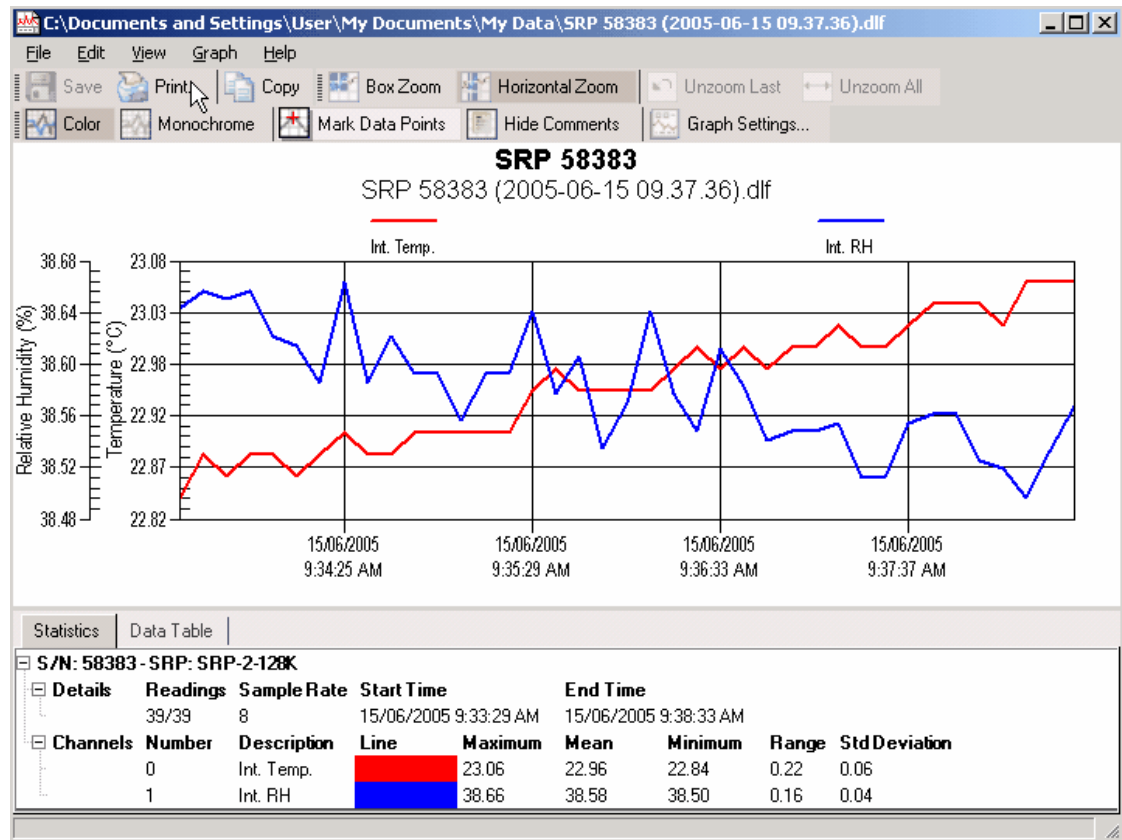
6. Click **Backup**.



7. In the Logger Backup Settings form that pops up, click **OK**.



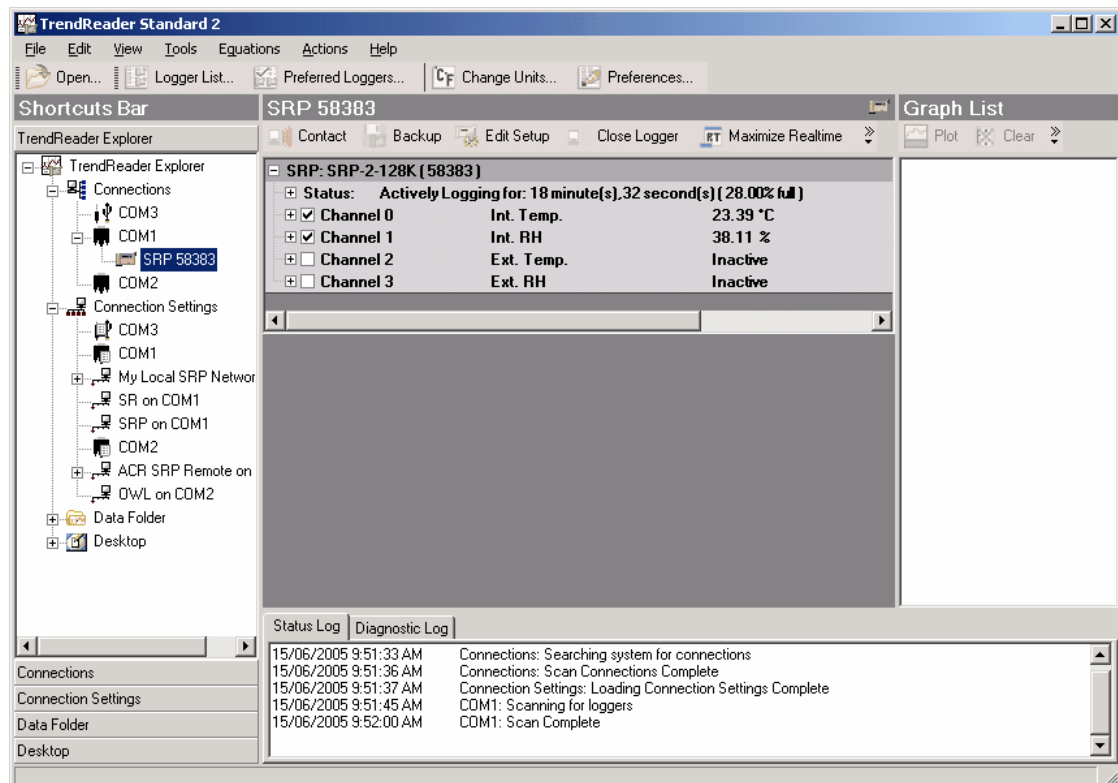
8. Once the data gets backed up, the graph should appear. Click on the **Print** icon to print the graph.



SECTION 5 User Interface

5.1 Introduction to User Interface

TrendReader Standard 2 has a standard, easy-to-use interface. There is the [Title Bar](#), [Menus](#), and [Toolbars](#) at the top. On the left side we have the [Shortcuts Bar](#), the [Work Area](#) in the centre and the [Graph List](#) on the right. Finally, we have the [Message Log](#) at the bottom.



5.2 **Title Bar**

The Title Bar shows the name of the software and has buttons at the far right.



You can minimize TrendReader Standard 2 by clicking on the . This will close the window and place an icon on the Task Bar, indicating that TrendReader Standard 2 is still running.

There are several ways to resize the window running TrendReader Standard 2. If the window is full screen, click on  to restore the window to a smaller size. You can then also drag the edges and corners to resize the window. To maximize the window again, click on . Also, double-clicking on the Title Bar will alternately restore and maximize the window.

To close TrendReader Standard 2, click on .

5.3 **Main Menu**

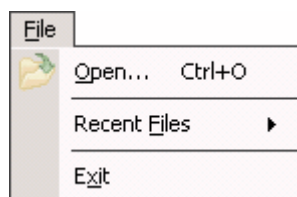
This section provides an overview of the organization of menus in TrendReader Standard 2. The menus and the functions available are described in the following chapters. Detailed descriptions can be found by following the given links.



File Edit View Tools Equations Actions Help

5.3.1 **File Menu**

The File Menu allows you to perform standard file and printing operations through the following selections: [Open](#), [Recent Files](#), and [Exit](#).



5.3.1.1 **Open**

Selecting Open from the File Menu pops up a standard Open file dialog box. From here you select the file you want to open. When a file is opened it is also graphed. You can choose a new format file, *.DLF, or an older format file, *.TRW or *.GPW. Note that for *.GPW files, the entire graph will be shown and comments may be out of place or not displayed.

When you open a file using the command, the graph will be displayed as it was saved. For example, if you had disabled one channel and had zoomed in on a section of the graph when you saved it, this is the way it will appear. If you add the graph to [Graph List](#) and open it from there, then the entire graph will be shown, not the zoomed section. Also, you will have the option of showing any or all of the channels.

5.3.1.2 **Recent Files**

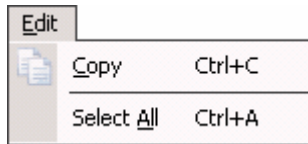
Selecting Recent Files from the File Menu brings up a list of the most recently used files. From here, simply select the file you want to open.

5.3.1.3 **Exit**

Selecting Exit from the File Menu will close the application.

5.3.2 **Edit Menu**

The Edit Menu allows you to perform the standard text editing functions [Copy](#) and [Select All](#).



5.3.2.1 **Copy**

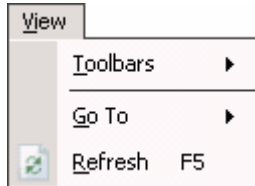
Selecting Copy from the Edit Menu will copy the highlighted text to the Clipboard.

5.3.2.2 **Select All**

Choosing Select All from the Edit Menu will select or highlight all the text in a field. You can then [Copy](#) the text.

5.3.3 **View Menu**

The View Menu allows you to select which [Toolbars](#) are to be displayed. If you are exploring the file system, you can use [Go To](#) to move around. Select Refresh to update the display if recent changes have been made, such as a logger file backing up.



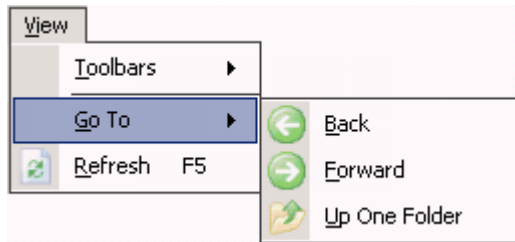
5.3.3.1 **Toolbars**

You can enable toolbars for various functions by selecting Toolbars from the View Menu. Check [Toolbars](#) to see which toolbars are available.

5.3.3.2 **Go To**

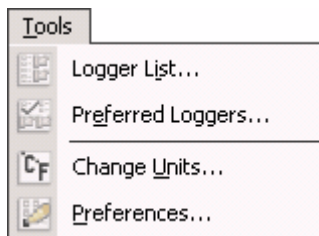
You can use the Go To menu to help you navigate your file system. The program keeps an ordered record of what folders you have recently displayed in the Work Area. Use the Back and Forward functions to access these recent folders. Up One Folder will take you to one level higher from the current folder in the folder hierarchy.

If you are not performing actions where the selections in the Go To menu are not applicable, such as contacting loggers, the Go To menu selection will not be available.



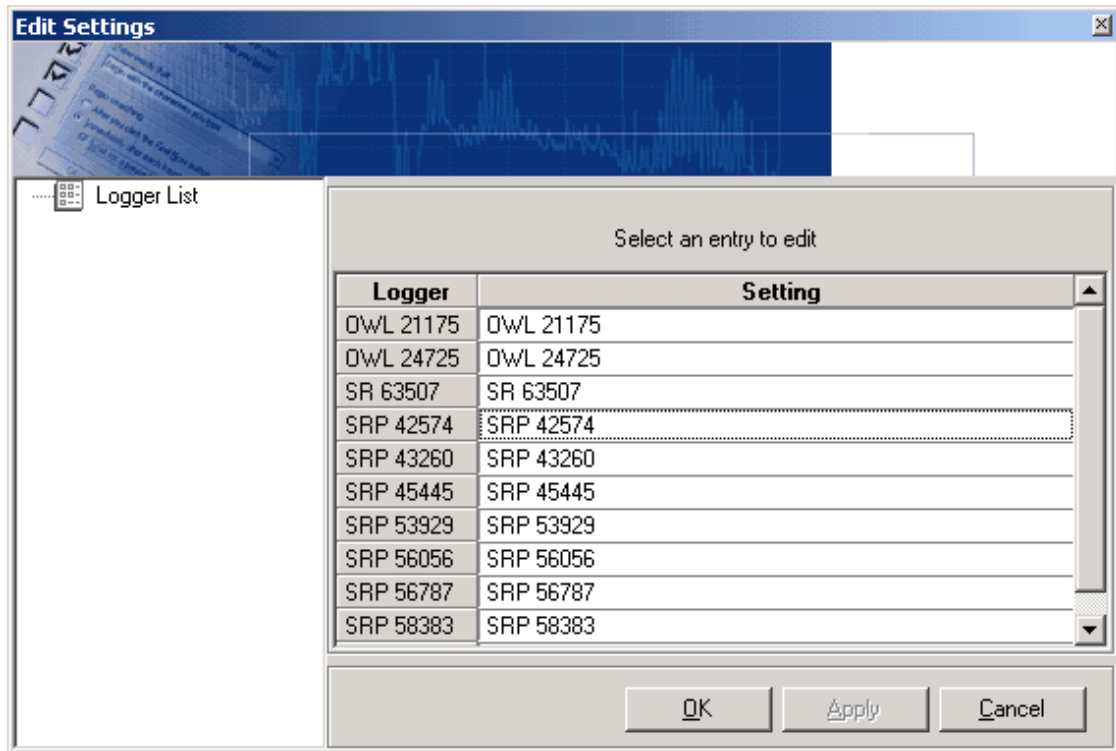
5.3.4 Tools Menu

In the Tools Menu, you can launch a variety of utilities that help you configure TrendReader Standard 2, including: [Logger List](#), [Preferred Loggers](#), [Change Units](#), and [Preferences](#).

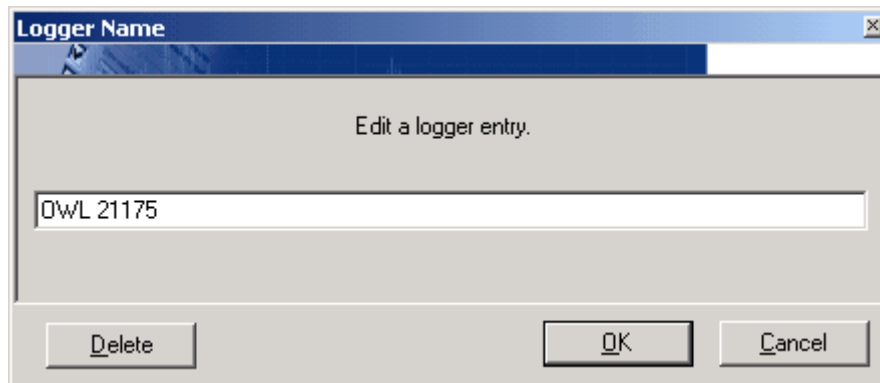


5.3.4.1 Logger List

Selecting Logger List from the Tools Menu will launch the Edit Settings window where you can edit logger names or delete loggers from the system.

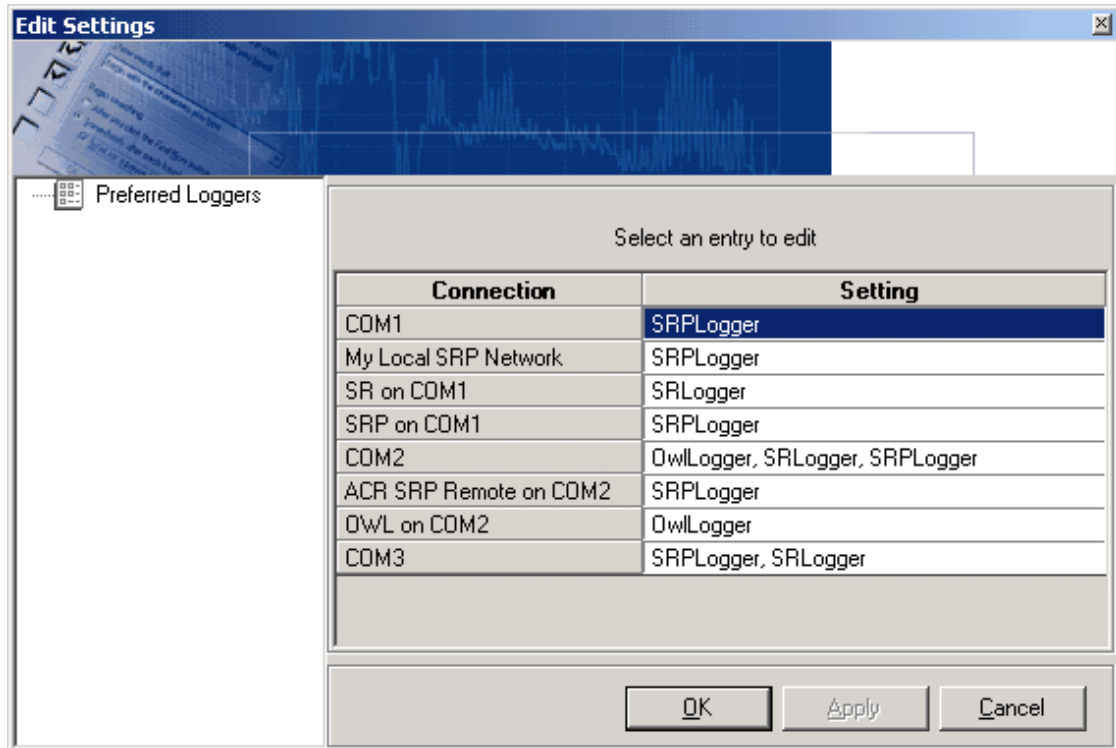


Click on a logger name to pop up the Logger Name form. To edit the logger name, click in the text field and type the new name. Click **OK** to accept the changes. Click **Delete** if you want to remove the logger. To save the changes to the system, you can either click on **Apply** or **OK** in the Edit Settings window. **OK** will implement the changes and close the window whereas **Apply** will leave the window open, thereby allowing you to make other changes.

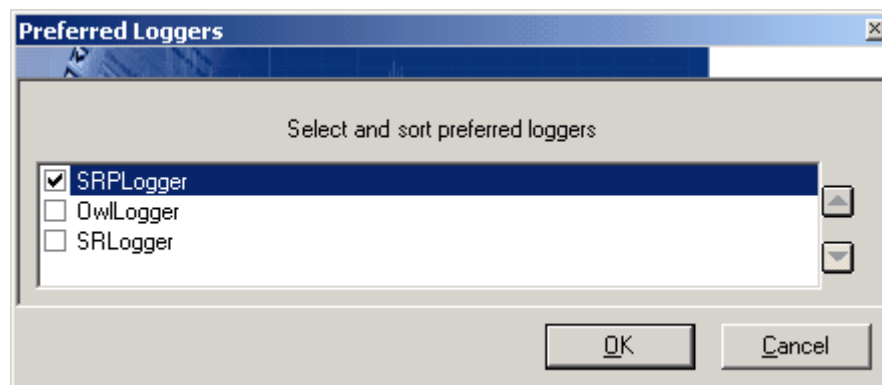


5.3.4.2 Preferred Loggers

Selecting Preferred Loggers from the Tools Menu will launch the Edit Settings window where you can set which loggers the application will search for, and in what order, for each connection setting.



Click on a connection setting to pop up the Preferred Loggers form. Click in the check box beside each logger type to add or remove that logger from the search list. Select a logger and then click on either of the "arrow" buttons at the right side to sort the loggers. Click **OK** to accept the changes. To save the changes to the system, you can either click on **Apply** or **OK** in the Edit Settings window. **OK** will implement the changes and close the window whereas **Apply** will leave the window open, thereby allowing you to make other changes.



5.3.4.3 **Change Units**

Selecting Change Units from the Tools Menu will launch the Preferences window and take you to the Axis tab of the default Graph Template screen. You can then select which units to use for your graph and Realtime readings.

5.3.4.4 **Preferences**

Selecting Preferences from the Tools Menu will launch the Preferences window where you can configure how you want TrendReader Standard 2 to appear.

5.3.5 **Equations Menu**

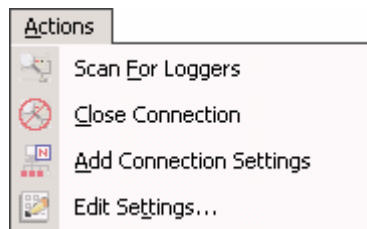
The Equations Menu provides you with tools for working with equations. You can create a New equation or Edit an existing one. With Import, you can bring in equations that were created on another computer or by an earlier version of the software. If you want to share your custom equation with someone else, you can Export equations. Select Compound Line to create or edit compound line equations. You can also Delete unwanted equations. See Equations for more details on equations or click on the links to learn how to perform the functions.



5.3.6 **Actions Menu**

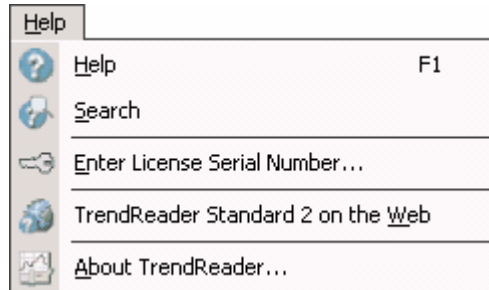
The Actions Menu provides you with various tools for functions that work with data loggers and connections. The items available in the menu depend on what has been selected in the Shortcuts Bar. See the [Shortcuts Bar](#) for a detailed description of the actions available.

As an example of the actions available, when a COM Port node is selected there are selections for Scanning for Loggers, Closing the Connection, Adding Connection Settings and Edit Settings.



5.3.7 **Help Menu**

The Help Menu allows you to access standard help and product related functions, including: displaying the [Help Manual](#) (contents or search function), entering the [License Serial Number](#), accessing the [internet](#), and displaying the [software version](#).



5.3.7.1 **Help**

Selecting Help from the Help Menu will launch the Help Manual, providing you with information on features of the software and instructions on how to execute functions.

5.3.7.2 **Search**

Selecting Search from the Help Menu will launch the Help Manual directly to the Search tab, from here you can search the Help files for information.

5.3.7.3 **License Serial Number**

When you purchase TrendReader Standard 2 you will be provided with a License Serial Number which you enter during the installation. If you installed a trial version of TrendReader Standard 2 and have recently purchased a full version, select Enter License Serial Number from the Help Menu to enter the serial number. Once a valid serial number has been entered, this menu selection will no longer be shown.

5.3.7.4 **TrendReader Standard 2 on the Web**

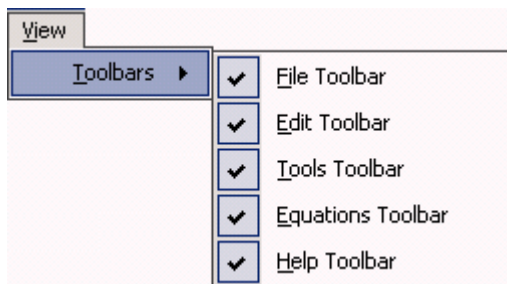
Selecting TrendReader Standard 2 on the Web will connect you to the ACR Systems Inc. web site, provided you have an internet connection.

5.3.7.5 **About TrendReader Standard 2**

Selecting About TrendReader Standard 2 from the Help Menu will pop up a window indicating the name and version of the software.

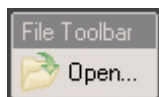
5.4 Toolbars

By selecting Toolbars from the View Menu, you can enable toolbars for [File](#), [Edit](#), [Tools](#), [Equations](#), and [Help](#) functions. The toolbars allow you quick access to commonly performed actions. Simply click on the icon to execute the function. They can be docked almost anywhere in the window, including over the work area, not just at the top. You can select text to be displayed beside the icons and enable tooltips from Preferences in the [Tools Menu](#).



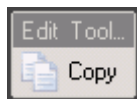
5.4.1 File

The File Toolbar has an icon allowing you to [Open](#) a file.



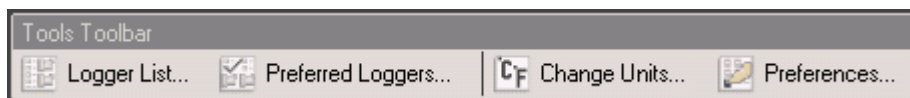
5.4.2 Edit

The Edit Toolbar has an icon allowing you to [Copy](#) the highlighted text.



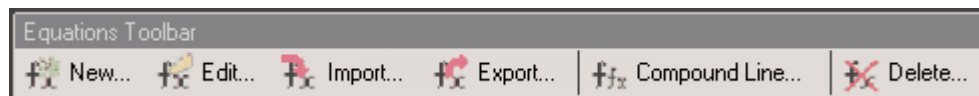
5.4.3 Tools

The Tools Toolbar has icons for a variety of utilities, including: [Logger List](#), [Preferred Loggers](#), [Change Units](#), and Preferences.



5.4.4 Equations

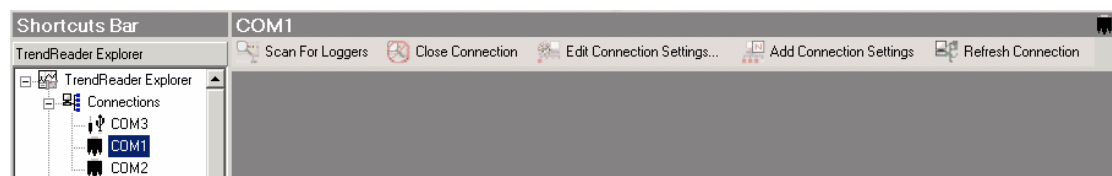
The Equations Toolbar has icons for working with equations: New, Edit, Import, Export, Compound Line, and Delete.



5.4.5 Actions

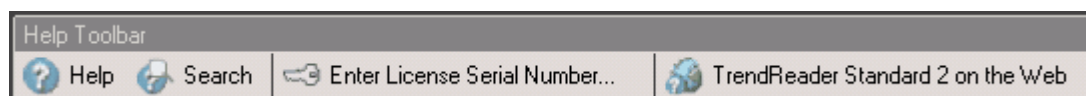
While there is no actual Actions Toolbar that you can enable or move around, the Action icons are part of the Work Area. The icons shown are dependent on what has been selected in the TrendReader Standard 2 Explorer Tree in the Shortcuts Bar. See the [Shortcuts Bar](#) for a detailed description of the TrendReader Standard 2 Explorer Tree and the actions available.

As an example, when a COM Port node is selected there are icons for Scanning for Loggers, Closing the Connection, Editing the Connection Setting, Adding Connection Settings, and Refreshing the Connection.



5.4.6 Help

The Help Toolbar has icons for displaying the [Help Manual](#), entering the [License Serial Number](#) (only for a trial version), and accessing the [internet](#).



5.5 Shortcuts Bar

The Shortcuts Bar houses the TrendReader Standard 2 Explorer Tree that allows you to quickly navigate and access your connected data loggers and data files. You can choose to view the entire tree by clicking on the TrendReader Standard 2 Explorer title bar or view individual nodes of the tree by clicking on the appropriate title bar within the Shortcuts Bar. The actions available are the same regardless of the selected view.

You use the [Connections](#) node to connect to loggers. The [Connection Settings](#) node is for storing settings for loggers you regularly access that have specific properties, such as networks or remote connections. The [Data Folder](#) node allows you to access the folder where your logger data files are stored by default. The [Desktop](#) node allows you to access all the folders in your system.

To execute functions on a selected node, you can select from the [Actions Menu](#), select a button at the top of the [Work Area](#) (beside the Shortcuts Bar), or simply right-click to pop up a menu. The actions available are the same in each option. Once an action is executed, the Work Area is updated with the results.

Shortcuts Bar

TrendReader Explorer

- TrendReader Explorer
 - Connections
 - COM3
 - COM1
 - COM2
 - Connection Settings
 - COM3
 - COM1
 - My Local SRP Network
 - SR on COM1
 - SRP on COM1
 - COM2
 - ACR SRP Remote on COM2
 - DWL on COM2
 - Data Folder
 - Desktop

TrendReader Explorer

Stop Refresh Home Page Search

TrendReader Explorer - Quick Start Guide

1. Connect your data logger to a communications port on your computer.

2. Double-click on the Connection Icon (A) in the Connections node, corresponding to the communications port, to contact your logger.

3. Click on the Backup button (B), located above the logger's status (C) in the Work Area (D), to backup the data and display it on a graph.

5.5.1 Connections Node

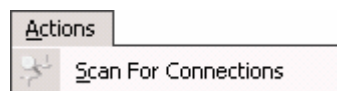
The Connections node is used for finding out information on the connections available on your computer. To contact a logger, see [connection](#).

The screenshot shows the TrendReader Explorer interface. On the left, the 'Connections' node is selected, displaying a list of available communication ports: COM3, COM1, and COM2. On the right, the 'Connections - Quick Start Guide' is displayed, which includes a diagram of the software interface with four labeled points (A, B, C, D) and a list of instructions:

1. Connect your data logger to a communications port on your computer.
2. Double-click on the Connection Icon (A) corresponding to the communications port, to contact your logger.
3. Click on the Backup button (B) located above the logger's status (C) in the Work Area (D), to backup the data and display it on a graph.

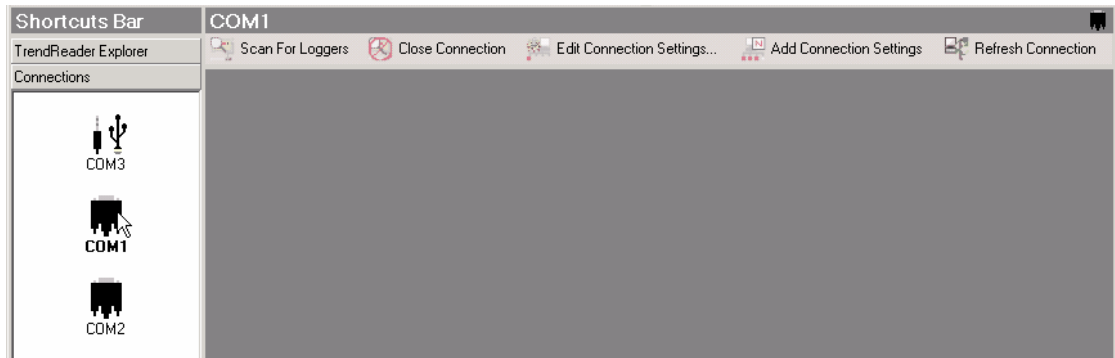
Actions

When the Connections node is selected, you can Scan for Connections. Scanning will check to see which communications ports are available. If you have added a port after running the program, such as by plugging in an IC102 Cable into the USB port, select Scan for Connections so that TrendReader Standard 2 can recognize the port. Also use Scan for Connections if you have connected an external modem after running the program. To avoid the need for scanning, simply connect the cable or modem before starting the program.



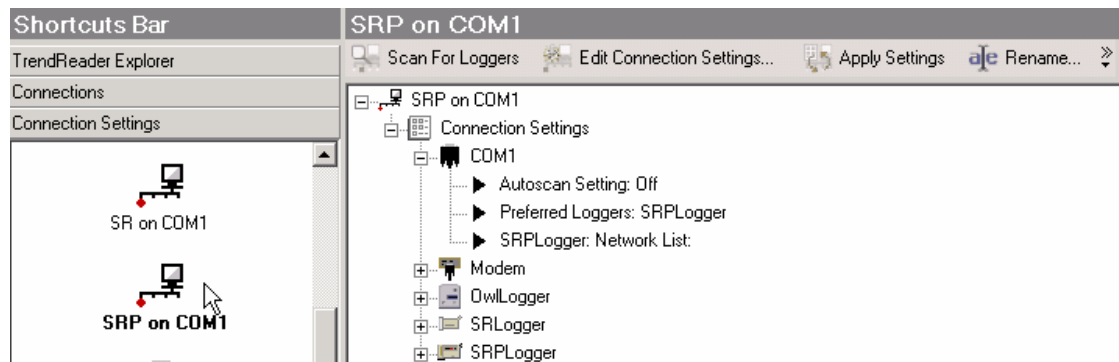
5.5.1.1 Connection

Connection settings are used for contacting loggers on a given connection. Before you contact a logger, you must first select the appropriate connection setting associated with the COM port the logger is attached to.

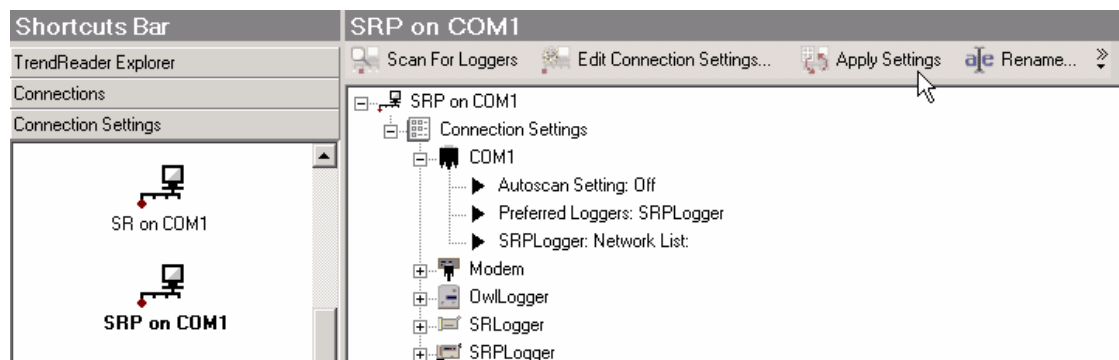


If your connection setting is not shown in the Connections node:

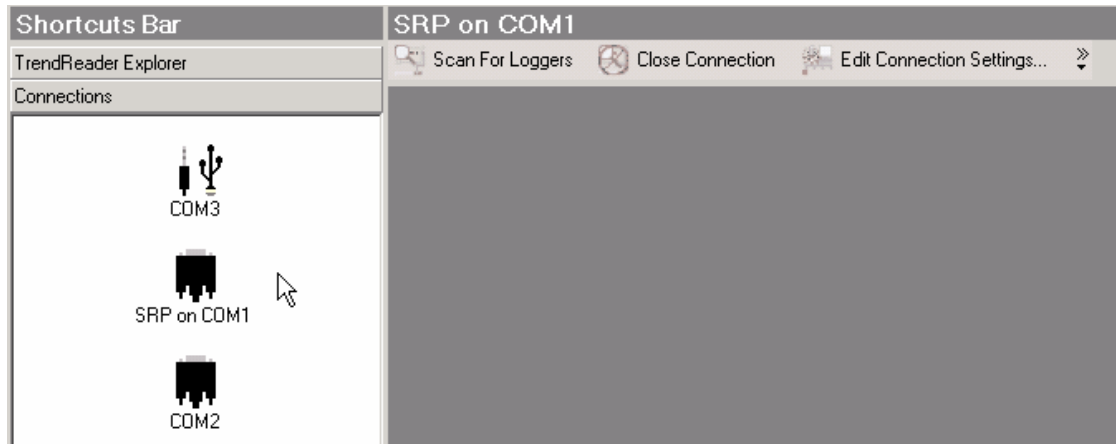
1. Click the Connection Settings node to see all the connection settings in the system and select your connection setting.



2. Click **Apply Settings**.

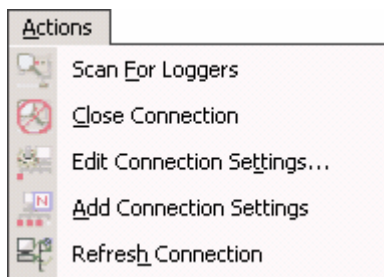


3. You will be brought back to the Connections node with your connection setting shown.

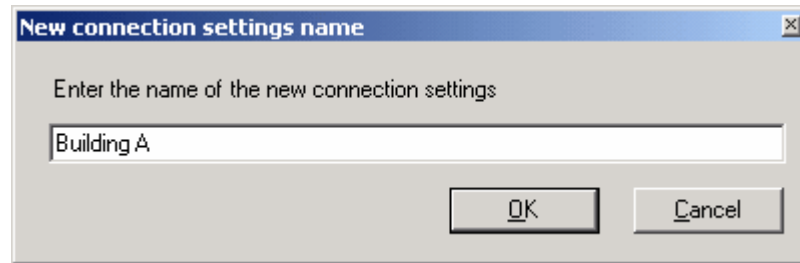


Actions

When a connection setting is selected, you can Scan for Loggers, Close the Connection, Edit Connection Settings, Add Connection Settings, or Refresh the Connection.



1. Scan for Loggers will contact and connect to loggers on the port associated with the connection setting. You can also double-click on the connection icon to scan the port. Make sure that you have connected your logger to the corresponding port using an interface cable, such as an IC-101, IC-102, or LIC-101. See [Logger](#) for details on what you can do once you connect to a logger.
2. If you are finished working with the loggers on the connection, select Close Connection to stop communication.
3. Edit Connection Settings will allow you to set the properties of the port. A window will pop up allowing you to configure COM, modem, and logger settings. See [Edit Settings](#) for further details.
4. Add Connection Settings will add another node, retaining the current port settings, to [Connection Settings](#). A window will pop up asking you for a name for the new setting.

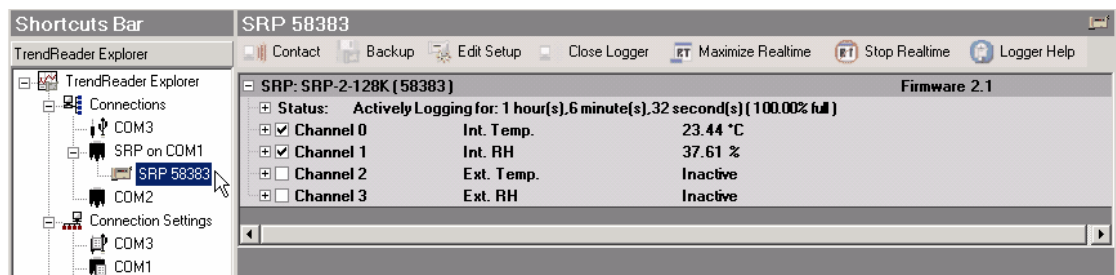


5. Refresh Connection will close and then re-scan the connection. This is useful if you were initially using the port as a serial connection but now want to use an external modem.

5.5.1.1.1 Logger

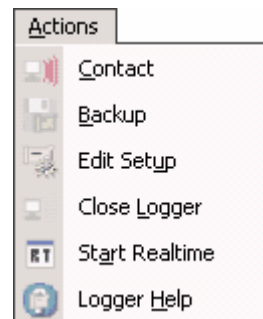
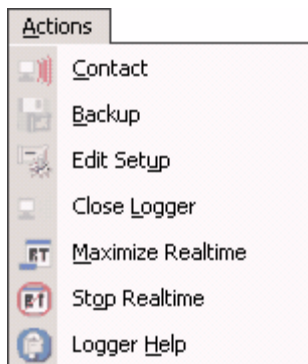
A Logger node is used to access connected loggers. Once a logger is contacted, its status is displayed. Initially, the COM Port menu actions are still shown at the top of the Work Area. If you want to perform actions on the logger, you need to first activate the logger menu.

If you are in the Connections view, click in the logger status window in the Work Area. If you are in the TrendReader Explorer, you can click on the logger serial number in the Shortcuts Bar or click in the logger status window in the Work Area. The Work Area with the logger menu is shown below.



Actions

When a Logger is selected, you can choose to Contact, Backup, Edit the Setup, or Close the logger. You can also Maximize the Realtime display and Stop and Start Realtime, if your logger supports Realtime, or display Help for your logger. Note that if you have a network of loggers, the actions will be performed only on the selected logger.

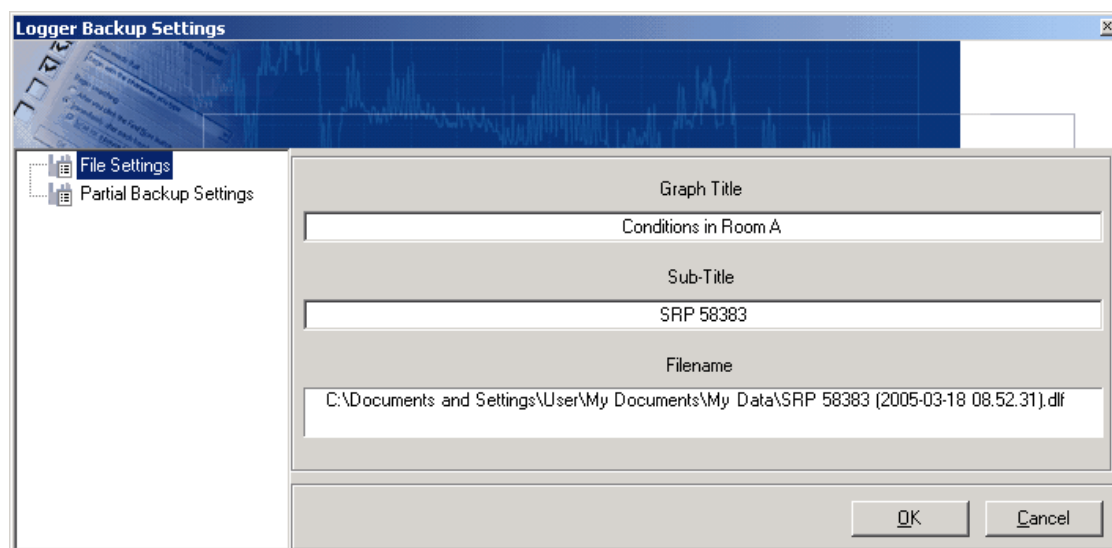


1. Contact will re-establish a connection with the logger or connect to a new logger if the previous one was removed.

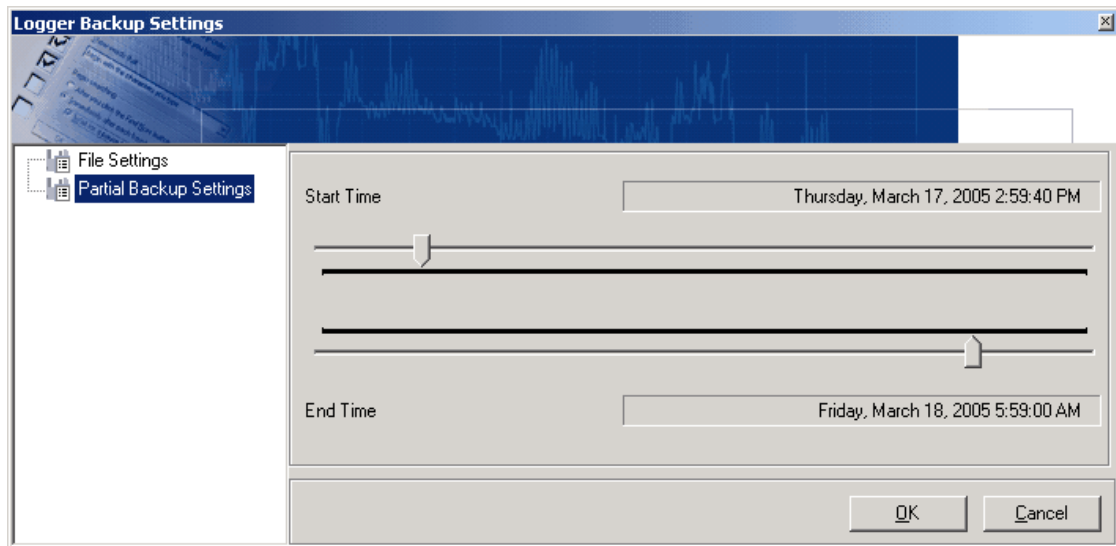
2. Backup will download the data from the logger into a file. See [Backing up a Logger](#) below for more details.
3. Selecting Edit Setup will pop up a form allowing you to configure the logger. Check the guide for your particular logger for information on the various parameters.
4. Closing the logger will disable the connection to the logger.
5. Maximizing Realtime will bring up a window showing the Realtime values of the channels of the logger. Check Realtime to see how the display works. Note that once enabled, the Realtime window will stay open, even if you Stop Realtime.
6. Stop Realtime will stop Realtimeing the logger. If you have previously stopped Realtime, then the menu selection will be Start Realtime.
7. If you are unsure of something, select Logger Help to get information about the features available for that logger type.

Backing up a Logger

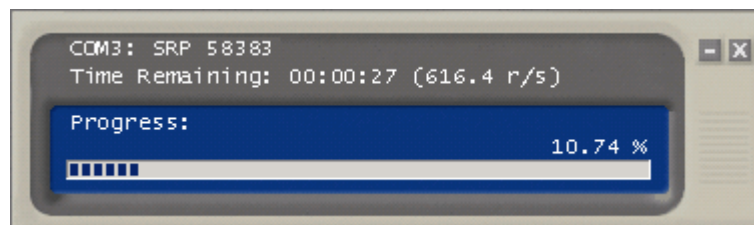
1. Contact the logger that you want to backup.
2. Select Backup from the Actions Menu, click the Backup button at the top of the Work Area, or right-click on the logger in the Shortcuts Bar to pop up a menu and select Backup.
3. If you have Enabled Backup Settings in Preferences, then a window will pop up asking you to enter the settings such as the file name. Otherwise, the backup of all the data in the logger will start automatically. In this case, the file name will contain the logger type, logger serial number, and the date and time. The file will be stored in the Data Folder.
4. In the Logger Backup Settings dialog box, you can change File Settings and Partial Backup Settings, if your logger supports partial backups. In File Settings, you set the graph title, sub-title, and file name. To change the title and sub-title, click on the appropriate field and enter the text. To change the file name and location, click in the file name field to bring up a standard Save As dialog box.



5. In Partial Backup Settings, you set the start and end times for the backup. To change the date and time, simply drag the start and end pointers to the desired date and time.



6. Once you have entered the settings, click OK to start the download. You will see a window detailing the progress.



7. If you have set your Preferences to open the graph when the backup is finished, a graph window will appear when the backup is complete.

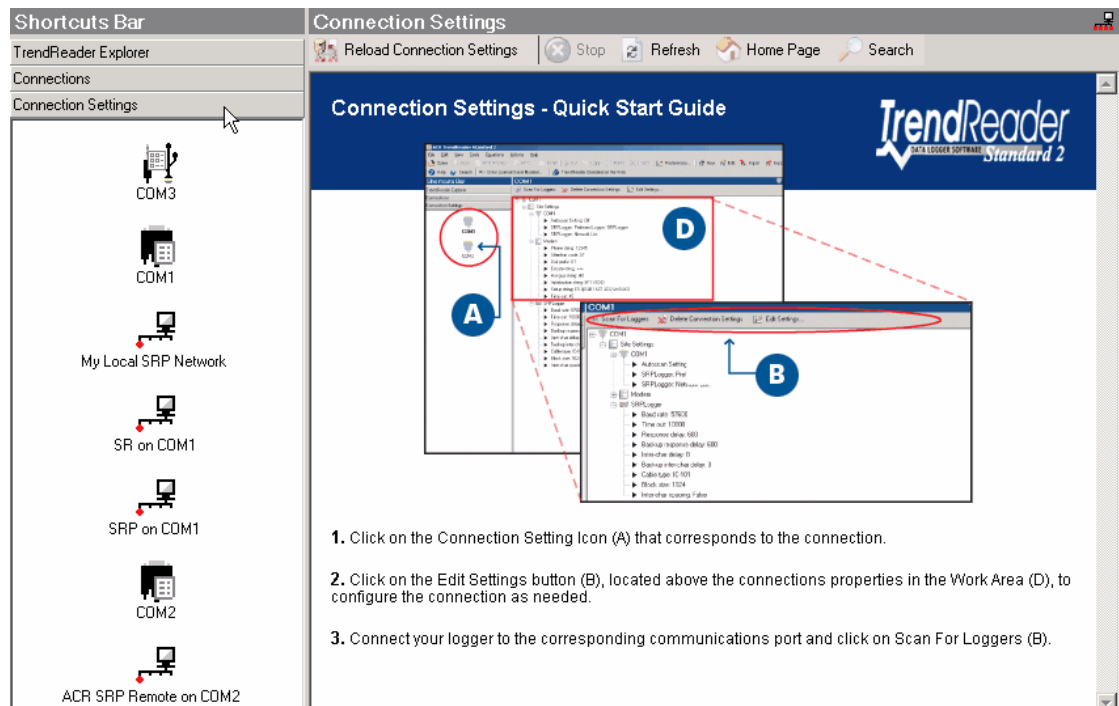
5.5.2 **Connection Settings Node**

If you have loggers that you regularly access, you can store the connection information under the Connection Settings node. This is most useful when you have networked loggers or differing connection properties. For example, if you were connecting to a network of loggers, you would save the network details in a connection setting, instead of entering them each time you accessed the network. Check your logger's guide for details on how to setup a network of loggers.

Another example is remotely connecting to loggers that have their own particular communications settings. Saving the connections would relieve you from having to remember and enter in all the modem settings for each remote site. Check Modems for details on using modems to communicate with loggers.

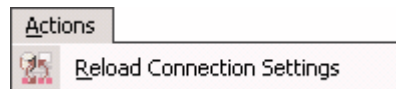
In Connection Settings, you also configure the default, or system-defined, settings for your connections. For example, you can set COM1 to only look for OWL loggers.

To create a user-defined connection setting, you must first select the appropriate COM Port in the Connections node (not Connection Settings) for the connection that you will be using. Select Add Connection Settings and enter a name. See [Edit Settings](#) for information on how to set the connection properties.



Actions

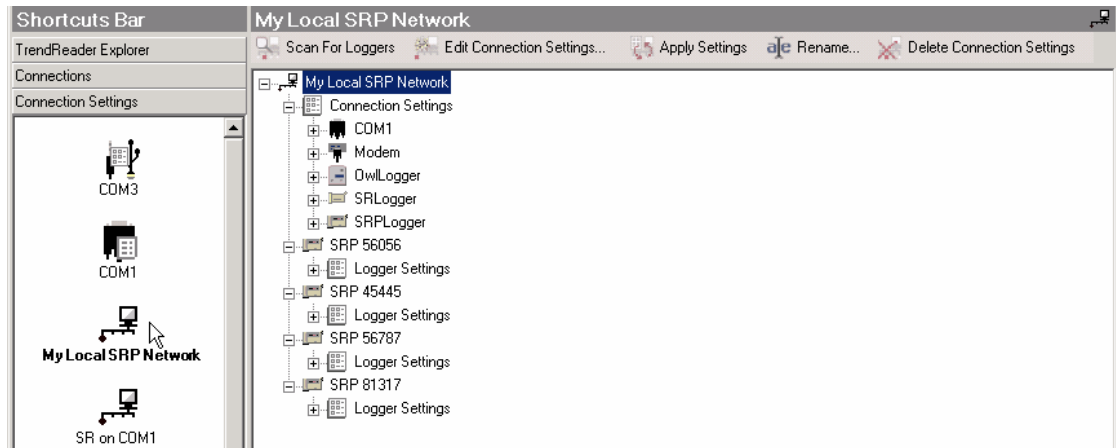
When the Connection Settings node is selected, you can Reload Connection Settings. Reloading will refresh the Connection Settings node with the connections stored in the database.



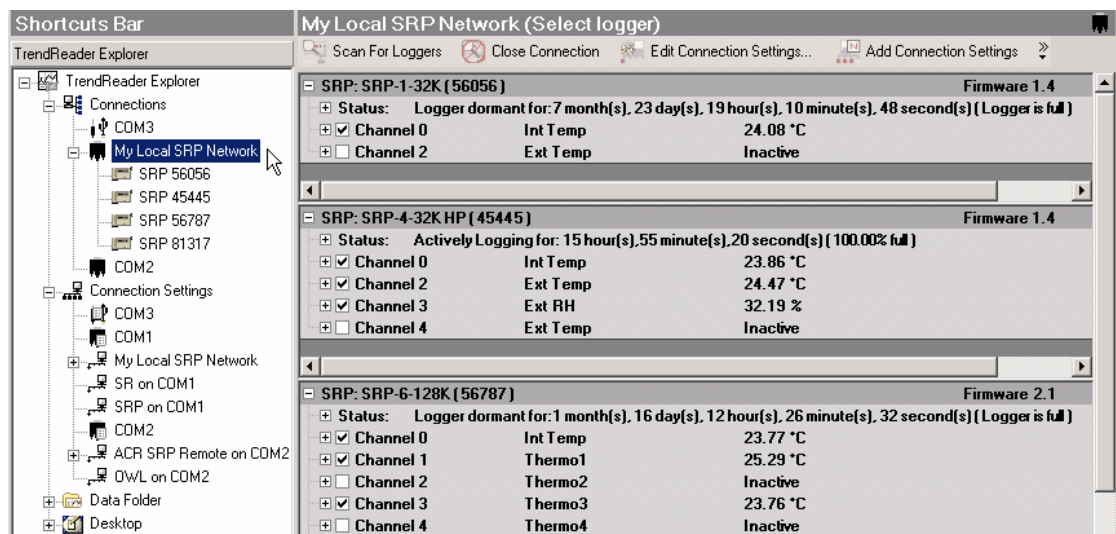
To access a particular setting, simply click on it under the Connection Setting Icon in the Shortcuts Bar.

5.5.2.1 Connection Setting

When you select a connection setting in the Connection Settings node, the Work Area shows the properties of the setting. If it contains a network, the loggers in the network are also displayed.



When you scan a connection setting, its properties are copied to the corresponding COM Port in the Connections Node, as shown below, and the loggers are contacted.

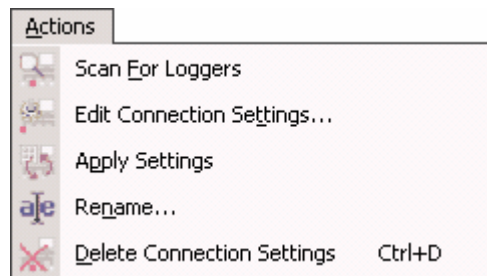


Under the Connection Settings Node you will also see COM Port connections. These system-defined connections store the original COM Port settings. In the example above, the "My Local SRP Network" setting is for a network of loggers connected on COM1. If you are finished with the network of loggers and want to connect a single logger to COM1, you can simply select the COM1 setting in Connections Settings and then scan for the logger.

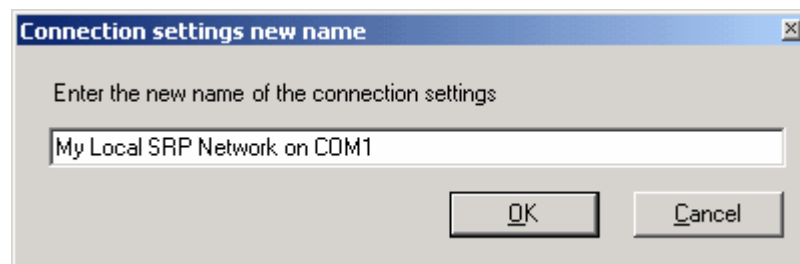
The connection settings are grouped together by COM Port. COM1 and saved settings using COM1 will be shown first at the top of the list. Listed next would be COM2 and saved settings that use COM2.

Actions

When a setting node is selected, you can Scan for Loggers, Edit the Connection Setting, Apply the Settings, Rename, or Delete the Connection Setting.



1. When you select to Scan for Loggers, the setting properties are first copied to the corresponding COM Port in the Connections Node. Then the port is scanned to see which loggers are connected.
2. Select Edit Connection Settings to set the properties of the connection. See [Edit Settings](#) for further details.
3. Select Apply Settings to copy the setting properties to the correspond COM Port in the Connections Node. Scanning for loggers does not occur.
4. Select Rename to change the name of the connection. A form will pop up where you can enter the new name. Click OK to save the new name.



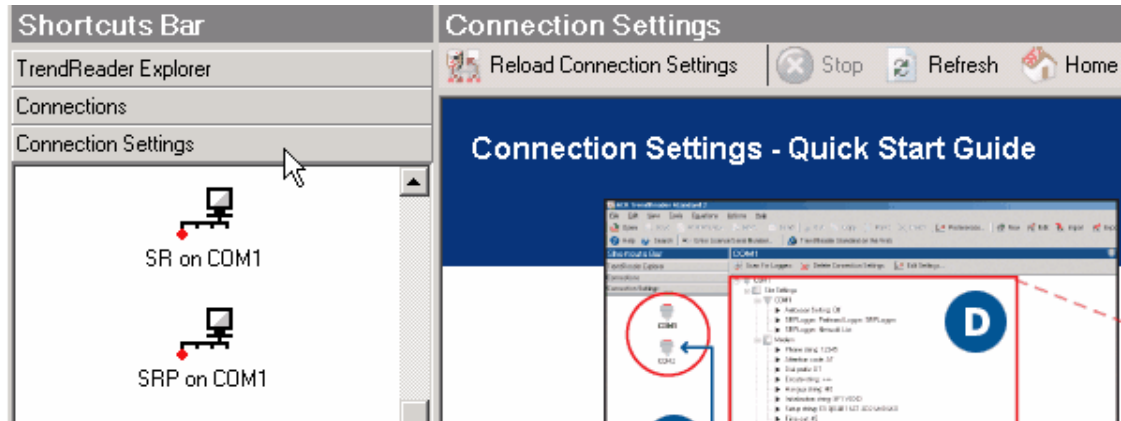
5. Selecting Delete Connection Settings will remove the selected setting from the Connection Settings Node. Before removal, a window will pop up asking for confirmation. Note that deleting a connection setting cannot be undone.

5.5.2.2 Edit Settings

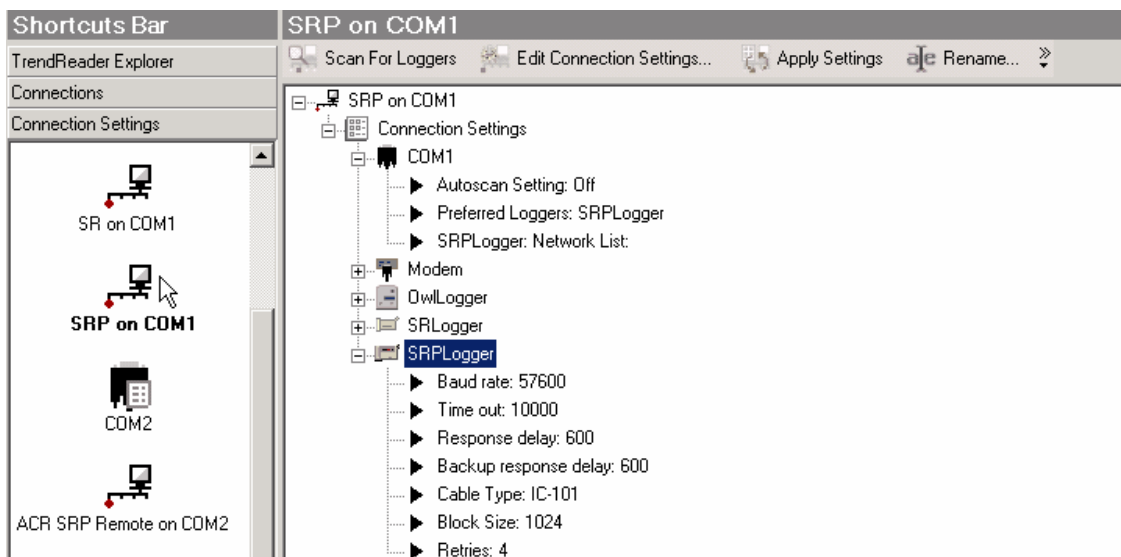
Connection settings have properties for the COM Port they are connected to, modem connections, and logger types.

To change a setting:

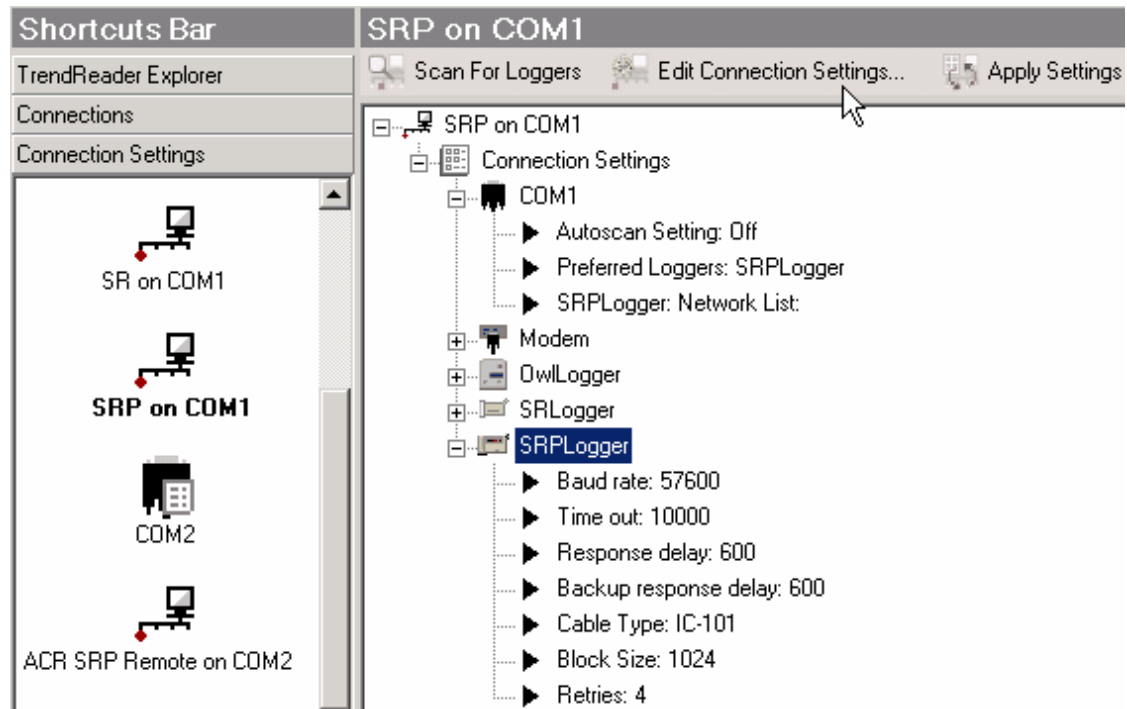
1. Select the connections setting view in the Shortcuts Bar.



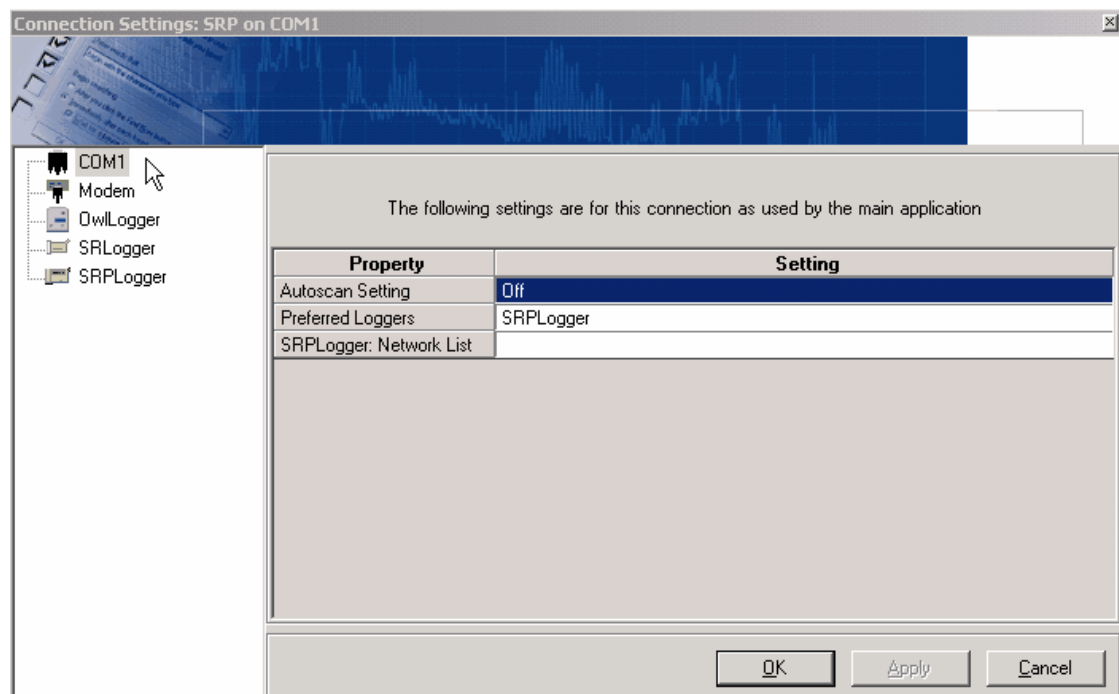
2. Click on the connection setting you want to edit. This can be a system-defined COM setting or a user-defined connections setting. The current properties will be shown in the Work Area.



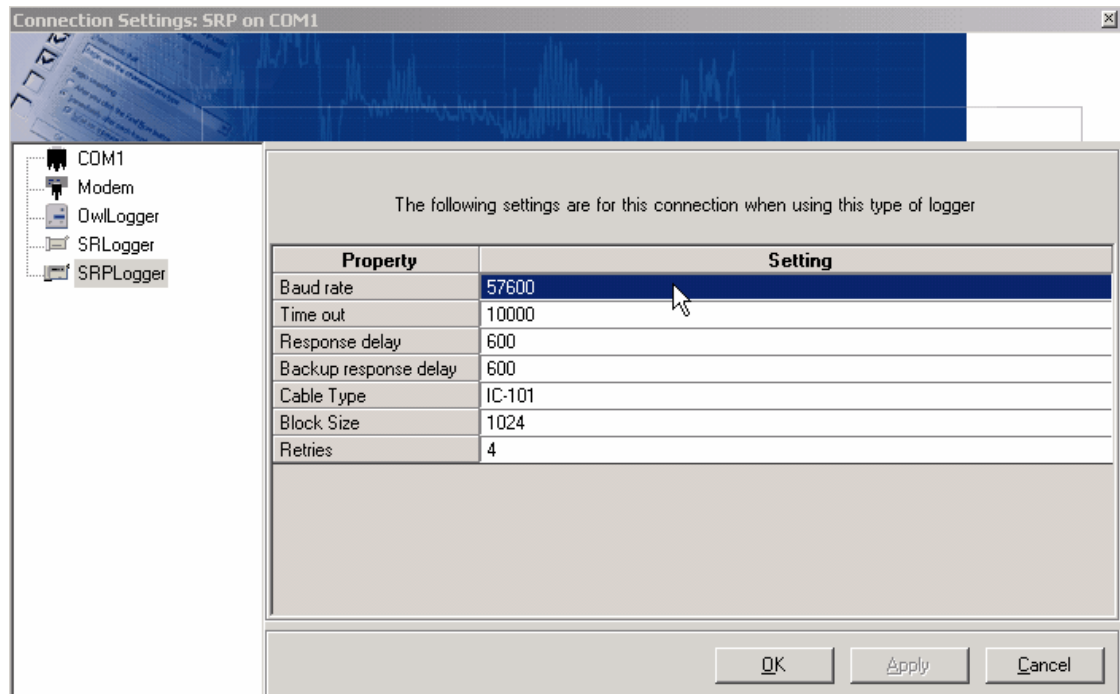
3. Select **Edit Connection Settings** from the Actions Menu, the Work Area, or the menu that appears when you right-click on the connection setting.



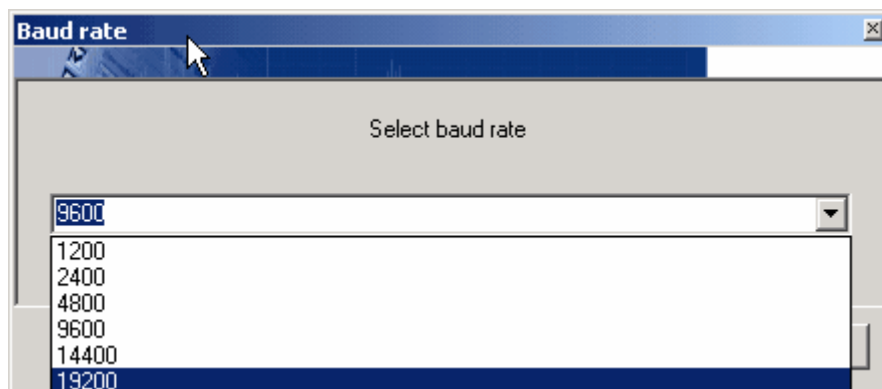
4. In the Connection Settings form that pops up, select the appropriate tab: [COM](#), [Modem](#), or [Logger type](#).



- To edit a property, click in the text field you want to change. For example, to set the baud rate for an SRP, first select the SRP tab and then click in the Baud Rate field.



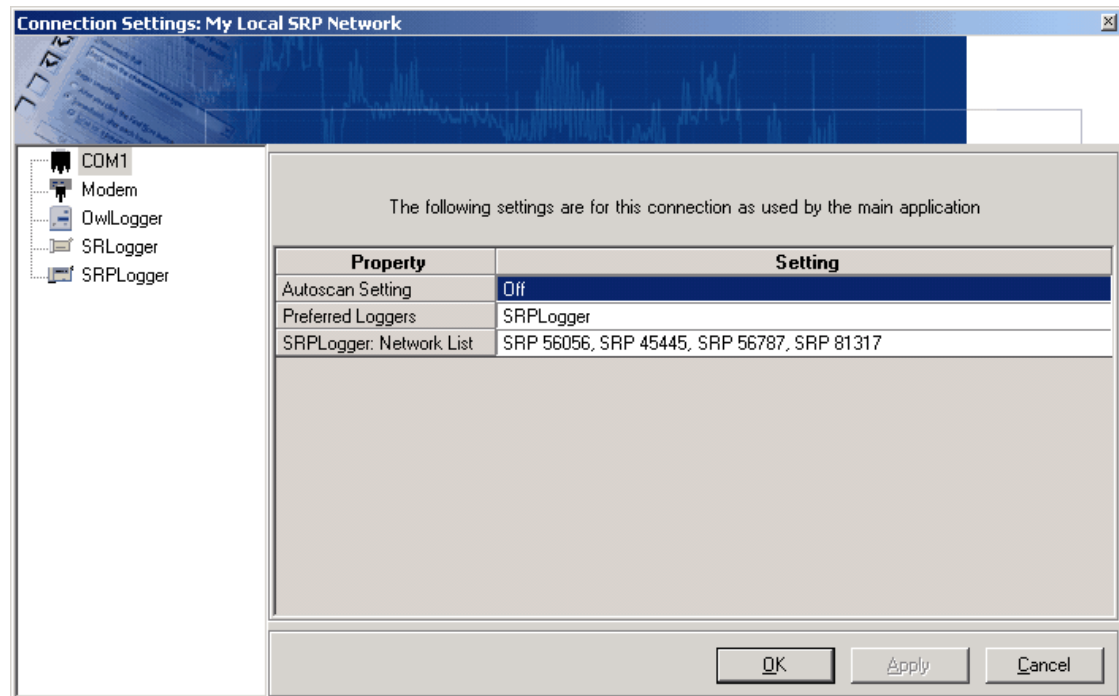
- A window will pop up allowing you to enter or select the new setting.



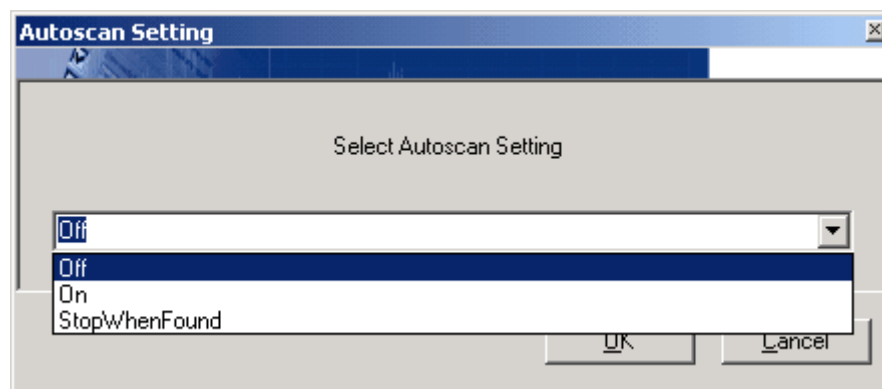
- Click **OK** to save the setting and close the pop up window.
- In the Connection Settings window, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make other changes.

COM Tab

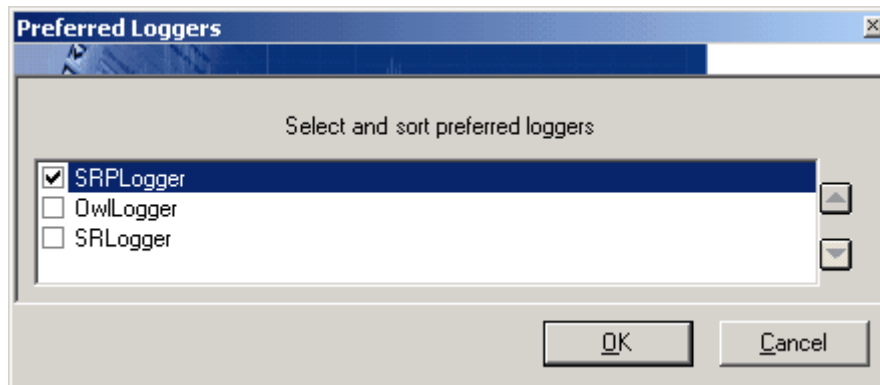
The COM Tab is for setting how the port functions and what loggers will be connected.



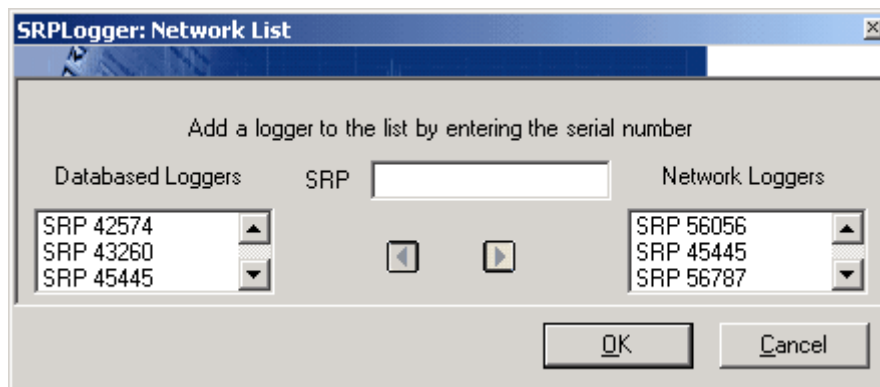
The Autoscan Setting determines when the application will search the connection for loggers. If the setting is On, the application will constantly scan to see which logger is connected. If the setting is Off, no automatic scanning will be done. You will need to click on Scan for Loggers to check for a connected logger. If the setting is StopWhenFound, the application will scan only until it finds a logger.



The Preferred Logger Setting determines which loggers the application will search for and in what order.

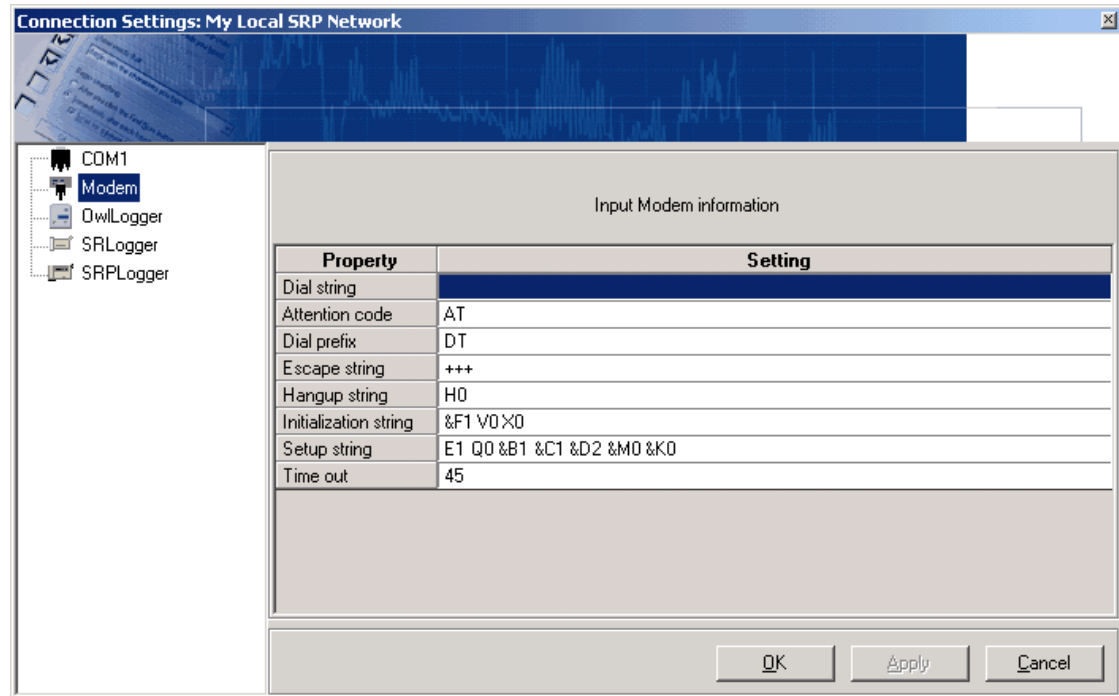


The SRP Logger Network List is used to indicate which loggers are connected in a network configuration for the connection. You can enter in the serial number of a logger or select it from a list of previously entered loggers.



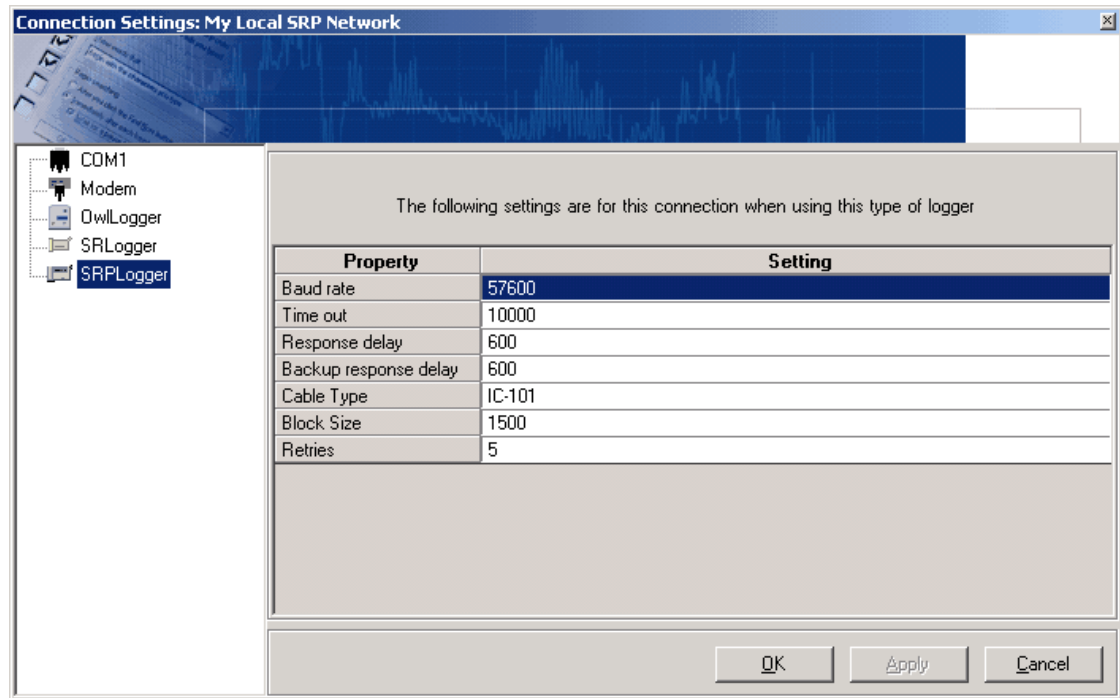
Modem Tab

The Modem Tab is for setting properties for the modem you use to connect to a remote logger. Note that these are the settings for your local modem. Check Modems for details on using modems to communicate with loggers. Please refer to your modem's manual to determine what values are appropriate.



Logger Tabs

The Logger Tabs are for setting the parameters the application will use to connect to the loggers.



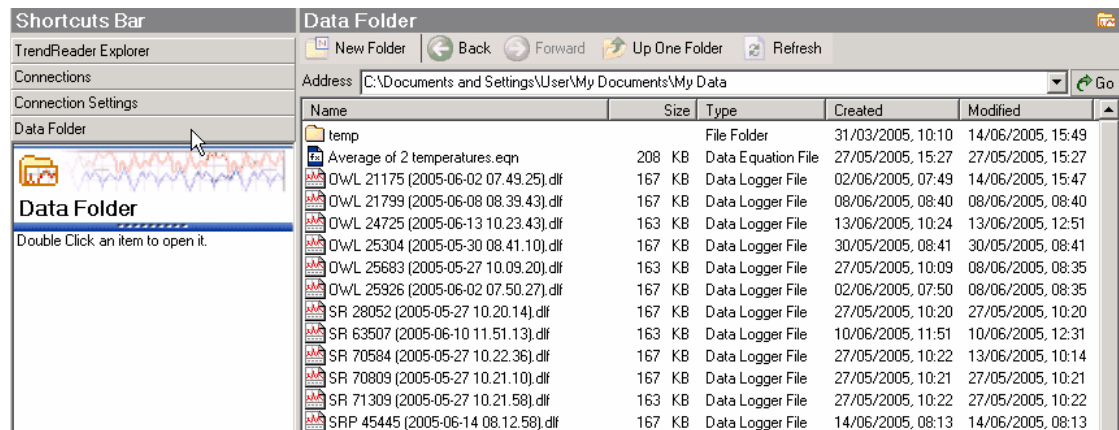
Your loggers should work properly with the default settings. Check the logger help file for your particular logger for further information.

5.5.3

Data Folder

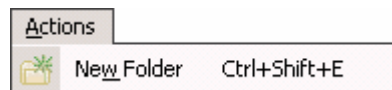
The Data Folder node provides a convenient place to organize all your logger data files. You can quickly access the files instead of having to navigate through numerous subdirectories and folders. The folder used as the Data Folder is set in Preferences. The Work Area shows the names and sizes of the files in a directory. When the data from a logger is backed up, the file will be stored in this folder by default. For a given file, you can save it in a different folder by first Enabling Backup Settings in Basic Settings and then selecting a new folder when backing up the logger.

The Work Area shows the name, size, creation and modification date for each file in the folder. Double-click on a [file](#) to display its details.



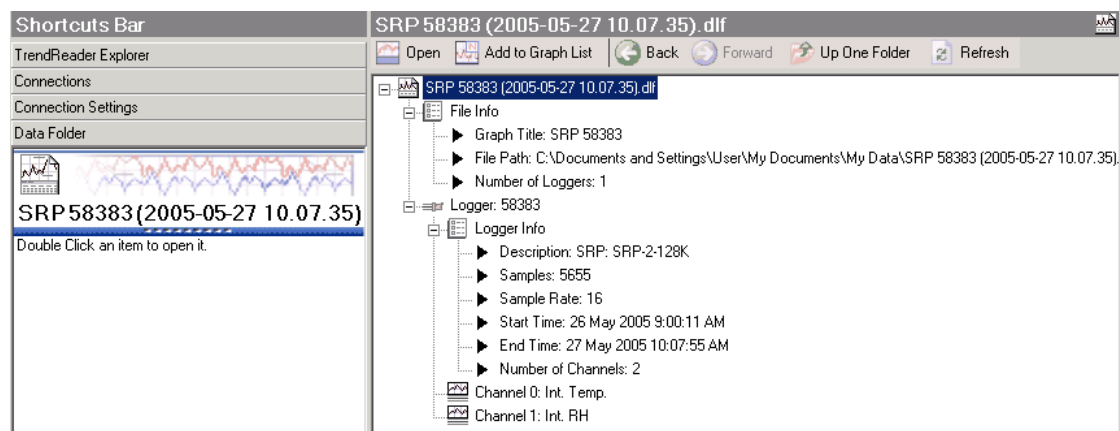
Actions

When a directory is selected, you can create a New Folder for storing files. Creating a new folder will create a new sub directory below the currently selected folder.



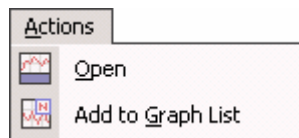
5.5.3.1 File

When you select a file, the Work Area will show a summary of the file and the logger. The file information includes the graph title, file path and number of loggers. The logger info includes the logger serial number, description, sample rate, start and end times, number of channels, and channel descriptions.



Actions

When a file is selected, you can Open it or Add it to the Graph List.

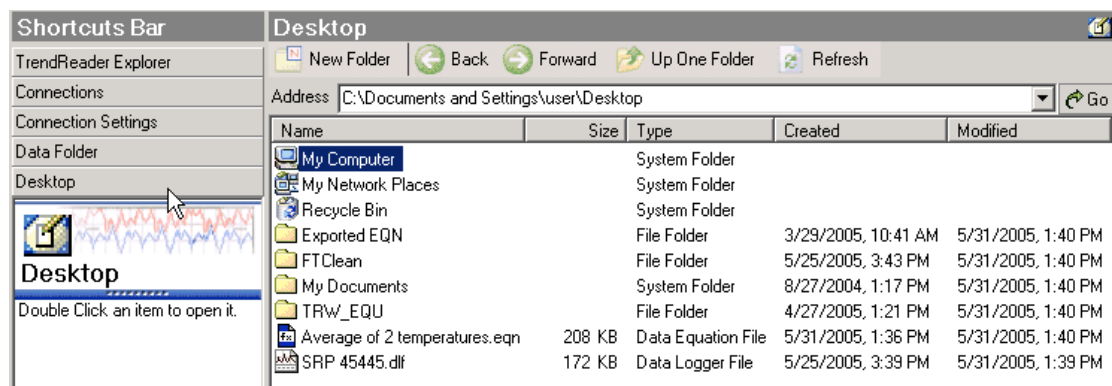


1. Select Open if you want to graph the file by itself.
2. Select Add to Graph List if you want to graph several files together. You can also drag the file from the Work Area to the Graph List. When all your files have been selected, click on Graph in the [Graph List](#) to display them.

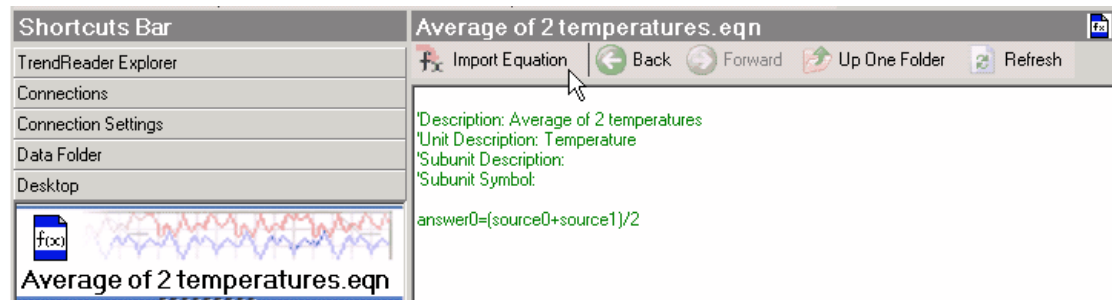
5.5.4

Desktop

The Desktop node allows you to access all folders in your system. It is essentially the same as the file explorer available on your computer, except only relevant files, such as data or equation files, are shown. You can perform functions such as copying and moving files in the same way as you would with the file explorer.

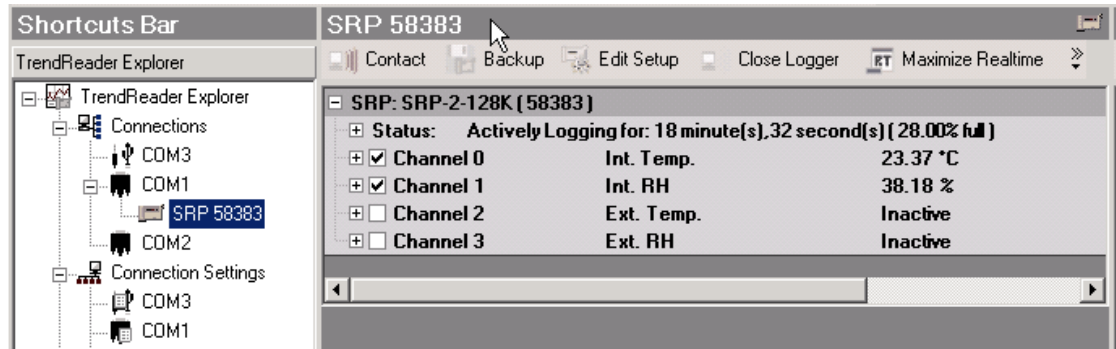


If there are data files (*.DLF, *.TRW, or *.GPW) in the folder, you can double click them to view the file details and then you can display them. If there are equation files (*.EQN or *.EQU), you can also double click them to view the source code. If the equation is not in the system, you can launch the Import Equation Wizard to bring it into the system.



5.6 Work Area

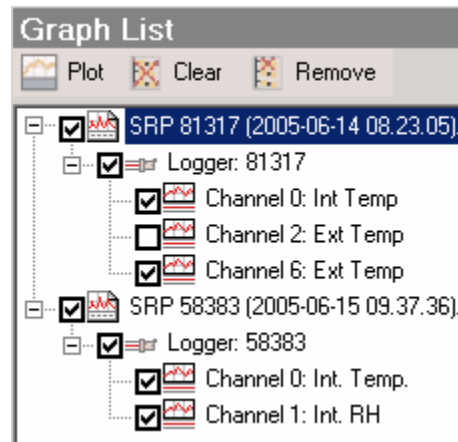
The Work Area shows the detail of the items selected in the [Shortcuts Bar](#). For example, if you have contacted a logger, the Work Area will show the status for that logger. Buttons for the functions available, essentially the Actions Toolbar, are shown at the top of the Work Area. The title of the Work Area will reflect the selection from the Shortcuts Bar. In this example, the logger type and serial number are shown in the title.



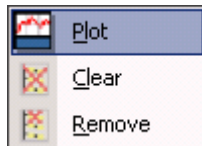
5.7 Graph List

You use the Graph List to organize files that you want plotted together on the same graph. Select files from the TrendReader Standard 2 Explorer Tree in the [Shortcuts Bar](#) and then add them to the list using the Actions Menu, the Work Area buttons, or by simply dragging the files to the Graph List. You can choose to graph only certain channels of a logger by clicking on the box beside the channel number. When all your files and channels have been selected, click on the Plot icon, at the top of the Graph List, to display them. Click on the Clear icon to clear the list of logger files or click on the Remove icon to remove just the selected file.

When you graph files from the Graph List the entire graph will be shown, regardless of whether the graph was saved in a zoomed state. If you graph two or more files together, they will be shown using the settings of the default graph template.

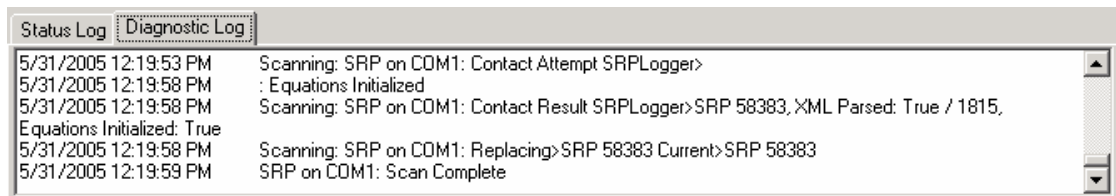
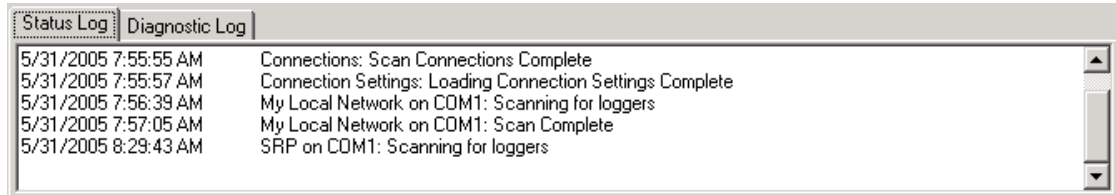


As well as clicking on the icons at the top of the Graph List, you can also right-click within the Graph List to pop up a menu with the same selections.



5.8 Message Log

The Message Log shows the actions that the program is performing. It shows the results of the actions and can be used to determine if an action was completed. The Message Log is divided into the Status Log and the Diagnostic Log. The Status Log is for general messages while the Diagnostic Log provides detailed information. The messages in the Diagnostic Log are also stored in a data file in order to help with any troubleshooting.

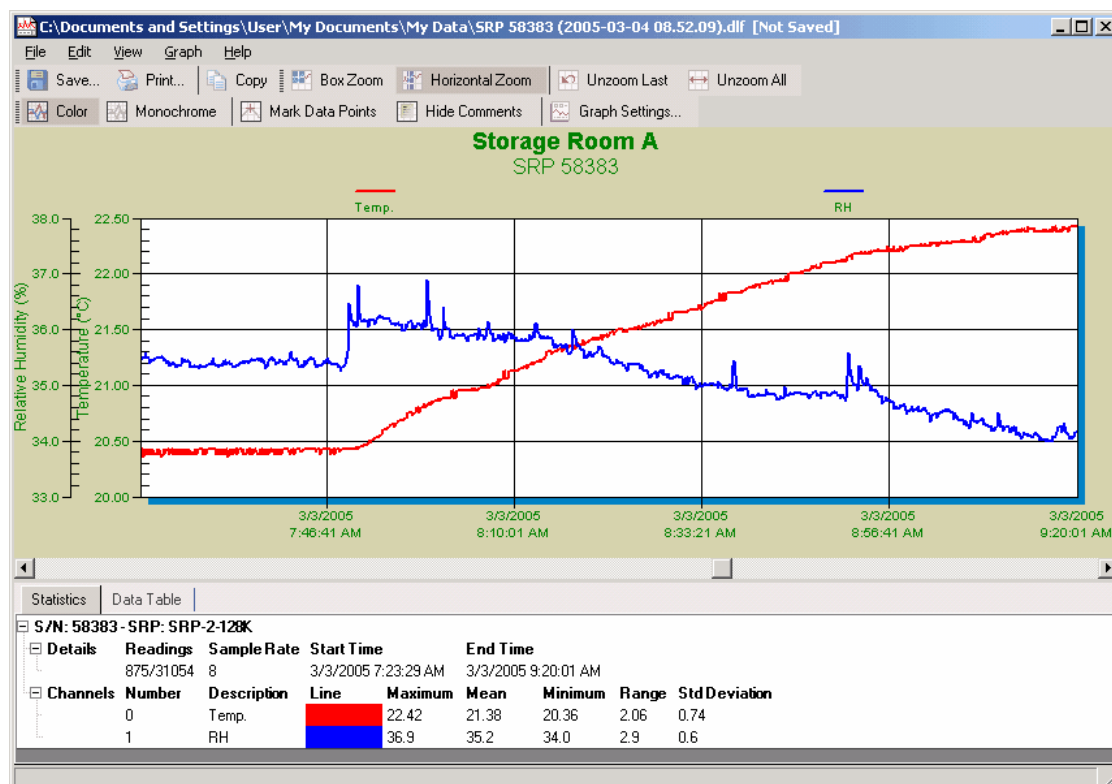


SECTION 6 Graphing

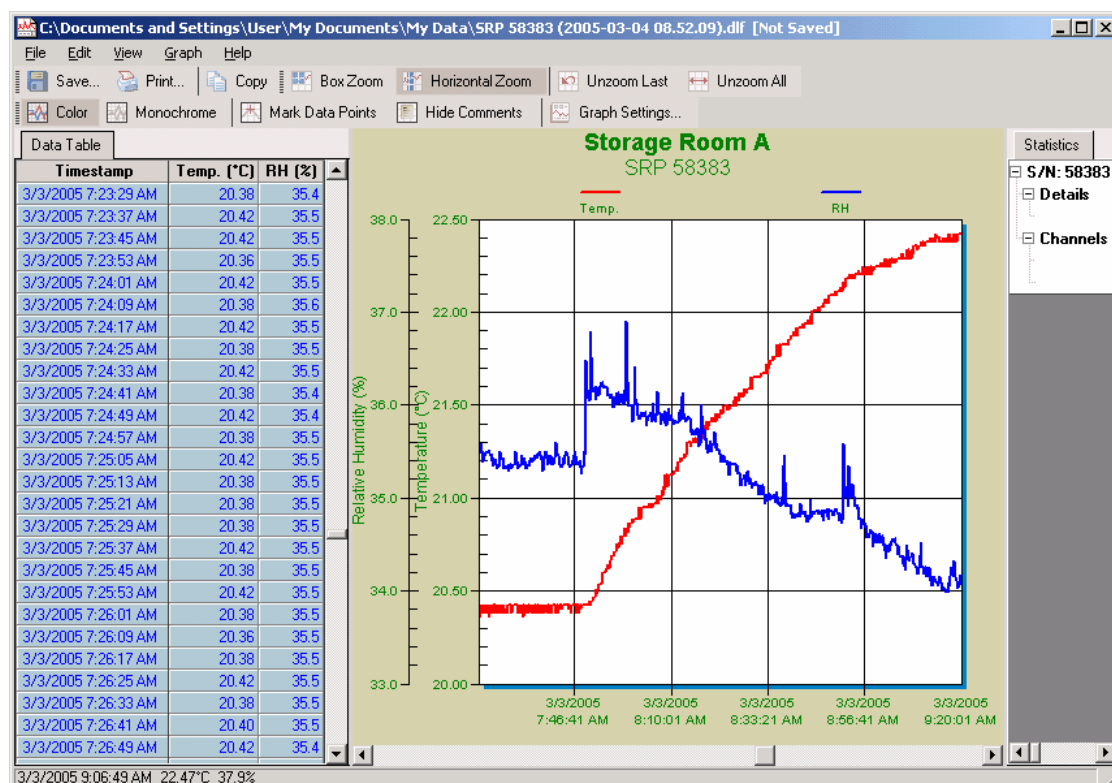
6.1 Introduction to Graphing

Graphs are used to display the data gathered by the logger. You can set an option in Preferences to automatically display the graph when a data logger is backed up. Alternatively, you can use the TrendReader Explorer to select channels from one or more files to display. First, navigate to find your data files. Once located, you can click on the Add to Graph List button or simply drag-and-drop them onto the Graph List. You can select all the channels in the file by simply selecting the file or you can select individual channels. See the Shortcuts Bar for further details on selecting files for graphing.

The data from the logger can be displayed in two forms: graphical and tabular. The [graph](#) displays a line for each channel selected. There is also an option to display a bar graph. The [tabular](#) form shows the data points in a spreadsheet format. Also, the [statistics](#) for the data set can be displayed.

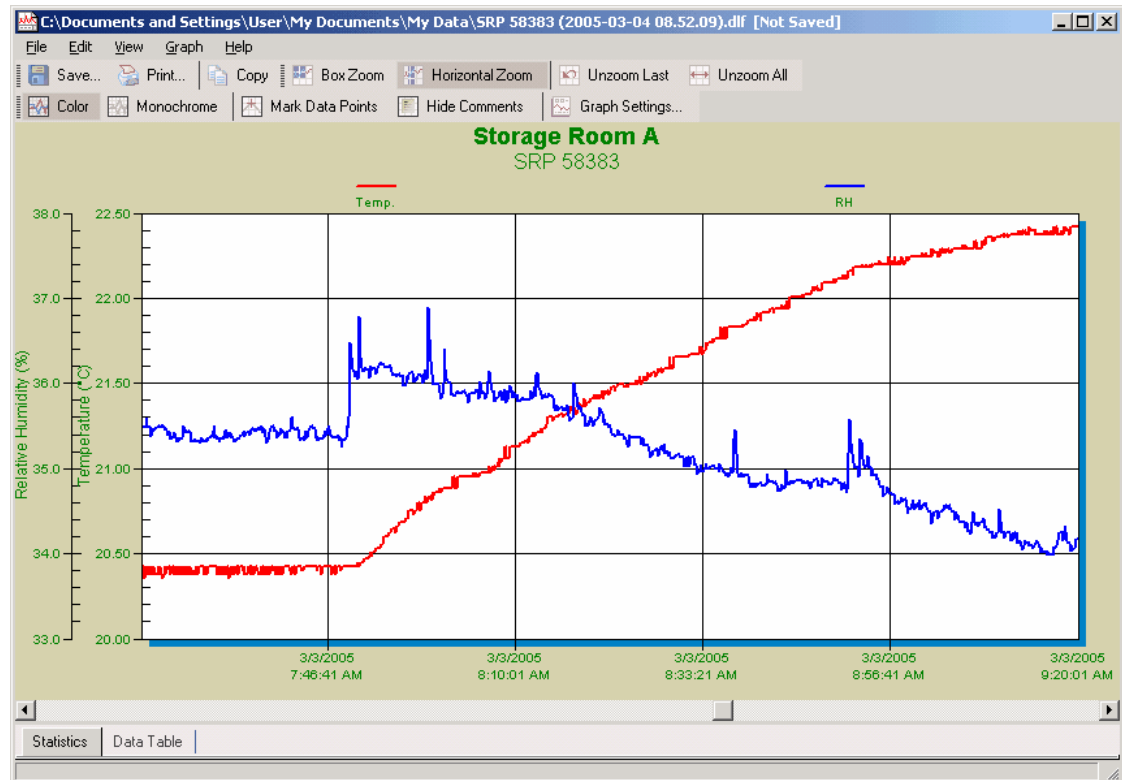


When a file is opened, the graph is shown at the top and the data table is shown in the lower quarter of the screen. If you want, you can choose to display only the graph or only the data from the [View Menu](#). You can also resize the data table by dragging its border. The Statistics Table and Data Table can also be individually docked at either side of the graph.



6.2 Graph Area

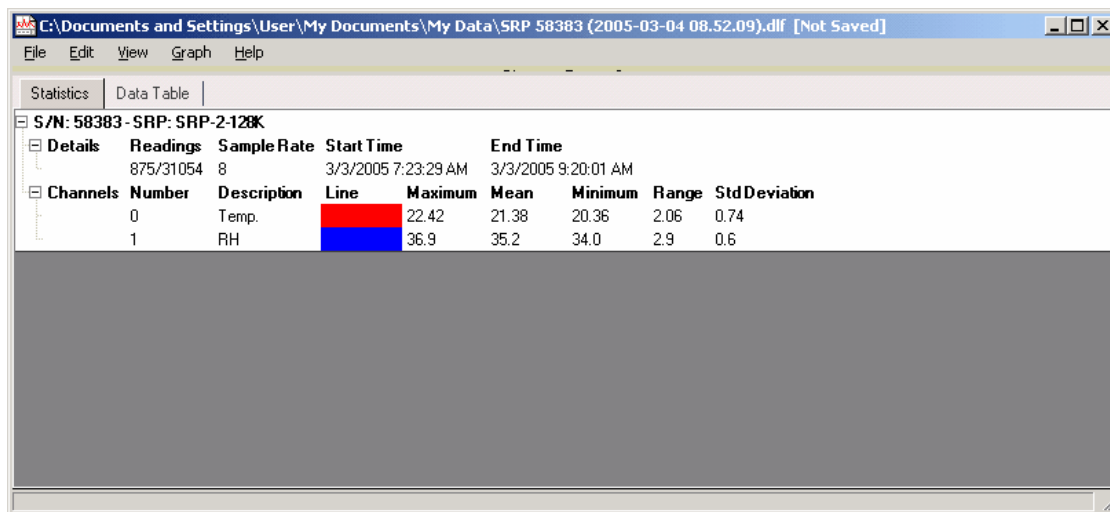
The Graph Area shows a line plot of the data for the selected channels. It is a typical graph and usually contains a title, a legend, grid lines, axis labels, and comments. You can customize your graph through settings found in the [Graph Menu](#). Additional lines, called [compound lines](#), which are based on formulas applied to the data, can also be added.



6.3 Statistics Table

The Graph Statistics Table shows basic statistics for each channel in the graph. If you have zoomed in on a section, only statistics on the visible section are shown. The information displayed includes the graph line number, description, maximum, mean, minimum, range, and standard deviation. Additional file information shown includes the sample rate, number of readings and the start and end time for the current view.

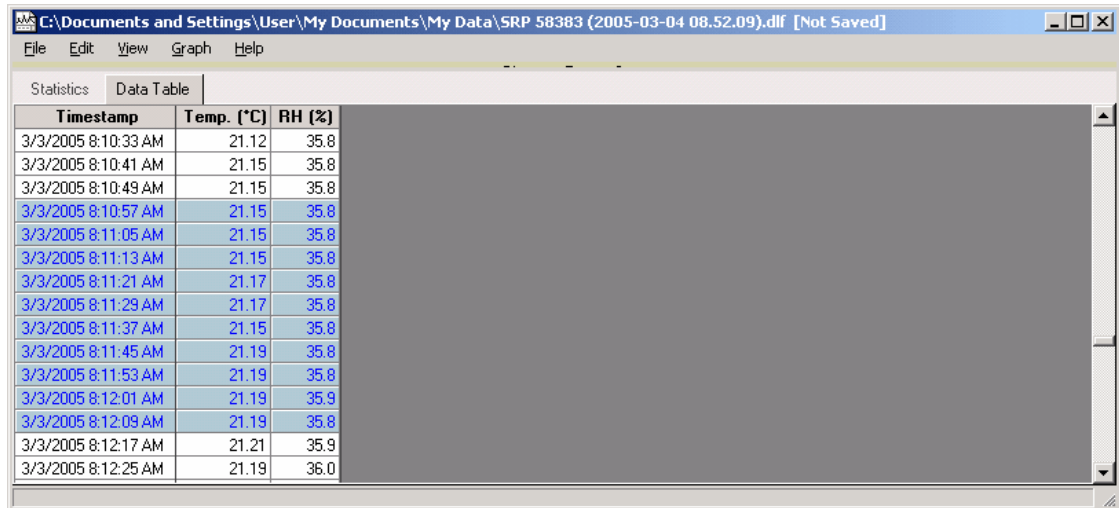
You can choose to show or hide information in a section, such as Channels, by clicking on the box beside the section title. If the information is already shown, the "-" will then change to a "+" and the section will be collapsed. Click on the "+" again to display the section.



S/N: 58383 - SRP: SRP-2-128K													
Details		Readings	Sample Rate	Start Time		End Time							
		875/31054	8	3/3/2005 7:23:29 AM		3/3/2005 9:20:01 AM							
Channels		Number	Description	Line	Maximum	Mean	Minimum	Range	Std Deviation				
		0	Temp.		22.42	21.38	20.36	2.06	0.74				
		1	RH		36.9	35.2	34.0	2.9	0.6				

6.4 Data Table

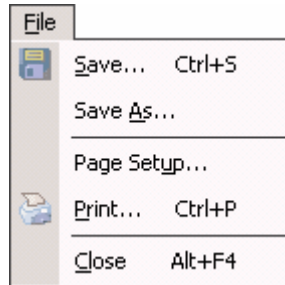
The Data Table shows the data points in a spreadsheet format. The first column shows the date and time of the sample. Subsequent columns show the value of the sample for each channel of the graph. The data points that are displayed in the graph will show in a different color.



Timestamp	Temp. (°C)	RH (%)
3/3/2005 8:10:33 AM	21.12	35.8
3/3/2005 8:10:41 AM	21.15	35.8
3/3/2005 8:10:49 AM	21.15	35.8
3/3/2005 8:10:57 AM	21.15	35.8
3/3/2005 8:11:05 AM	21.15	35.8
3/3/2005 8:11:13 AM	21.15	35.8
3/3/2005 8:11:21 AM	21.17	35.8
3/3/2005 8:11:29 AM	21.17	35.8
3/3/2005 8:11:37 AM	21.15	35.8
3/3/2005 8:11:45 AM	21.19	35.8
3/3/2005 8:11:53 AM	21.19	35.8
3/3/2005 8:12:01 AM	21.19	35.9
3/3/2005 8:12:09 AM	21.19	35.8
3/3/2005 8:12:17 AM	21.21	35.9
3/3/2005 8:12:25 AM	21.19	36.0

6.5 **File Menu**

The File Menu allows you to perform standard file and printing functions, including: [Save](#), [Save As](#), [Page Setup](#), [Print](#), and [Close](#).



6.5.1 **Save**

Selecting Save from the File Menu will save the changes in the graph to the current file. See [Save As](#) if you want to change the file name or file format.

6.5.2 **Save As**

Save As allows you to change the file name, while keeping the same data logger format, or to save the graph in a different file format. When you select Save As from the File Menu, a standard Save As window pops up allowing you to enter a new name and file format.

To save the numerical graph data, you can select either CSV (comma separated) for spreadsheets or TXT (text) for word processors.

To save the graph as a picture, you can select BMP (bitmap) or JPG for paint and drawing programs. The BMP option will result in a large file, while the JPG file will be a compressed version. You can also select PDF for a portable document format for use with Adobe Reader.

6.5.3 **Page Setup**

Selecting Page Setup from the File Menu will pop up a standard print dialog box allowing you to setup how the graph will be printed.

6.5.4 **Print**

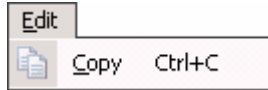
Selecting Print from the File Menu will pop up a standard print dialog box allowing you to print the graph.

6.5.5 **Close**

Selecting Close from the File Menu will close the graph window.

6.6 **Edit Menu**

The Edit Menu allows you to [Copy](#) items to the Clipboard.



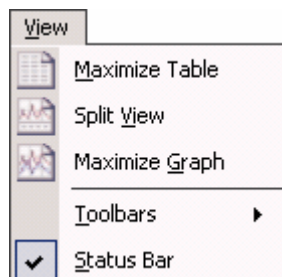
6.6.1 **Copy**

The easiest way to copy an item is through right-clicking. If the pointer is over the graph, a copy of the graph is put in the Clipboard. When the pointer is in the data points section, a table of the currently displayed graph data is copied. Similarly, when in the statistics section, the statistics are copied.

You can also select Copy from the Edit Menu to copy an item to the Clipboard. To choose what is copied, you must make the section active. For example, if you want to copy the data points, click to select the Data Table Tab and then click on the table. Next, select Copy from the menu.

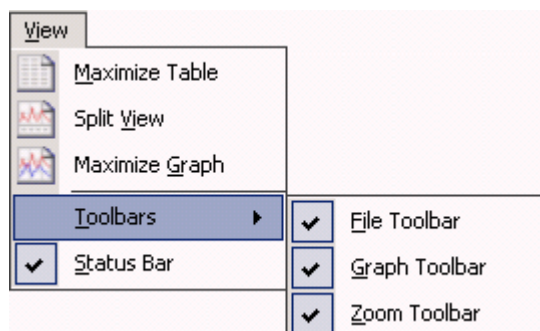
6.7 View Menu

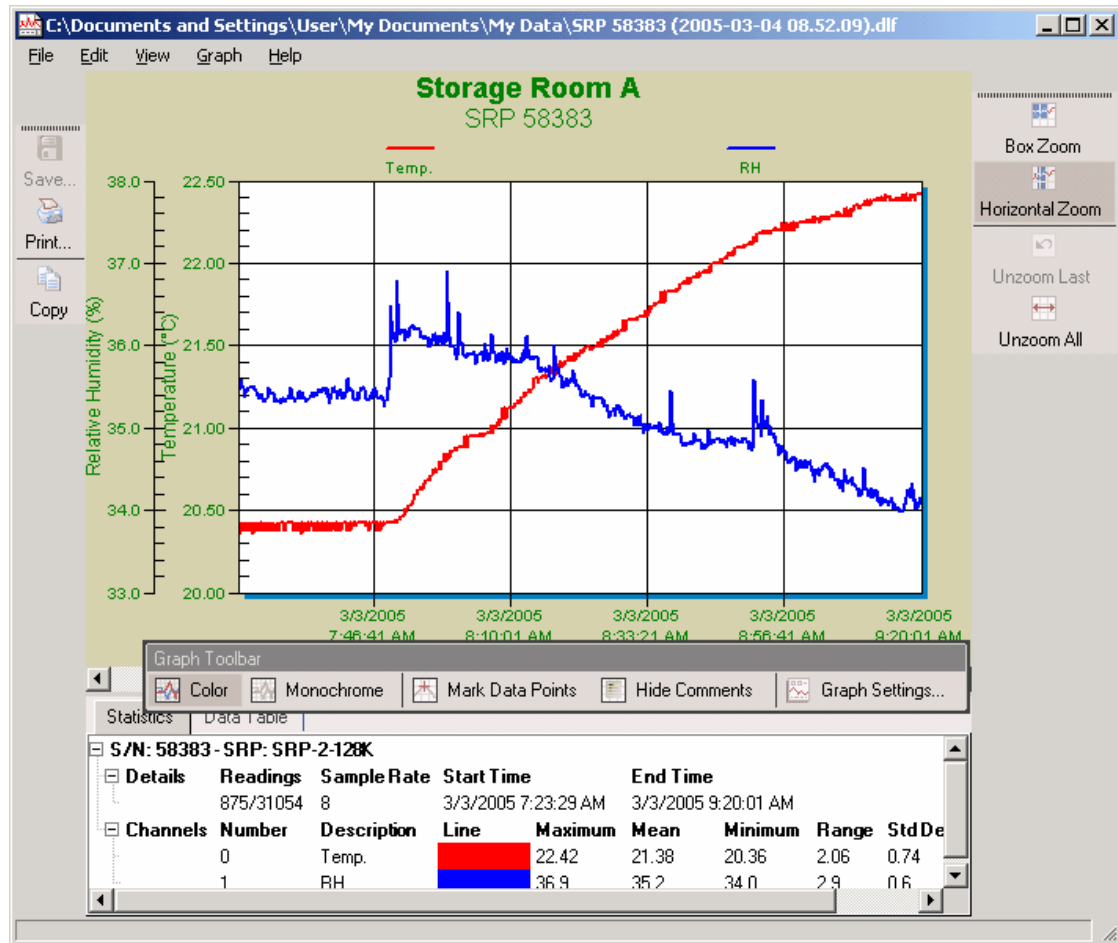
The View Menu allows you to select which [Toolbars](#) are to be displayed and if the [Status Bar](#) is displayed. You can also determine if the table and graph are displayed in the window through [Maximize the Table](#), [Split View](#), and [Maximize the Graph](#).



6.7.1 Toolbars

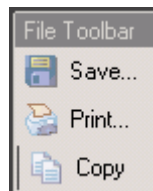
By selecting Toolbars from the View Menu, you can enable toolbars for [File](#), [Graph](#), and [Zoom](#) functions. The toolbars allow you quick access to commonly performed actions. Simply click on the icon to execute the function. They can be docked almost anywhere in the window, including over the graph itself, not just at the top. You can select text to be displayed beside the icons and enable tooltips from Preferences in the Tools Menu.





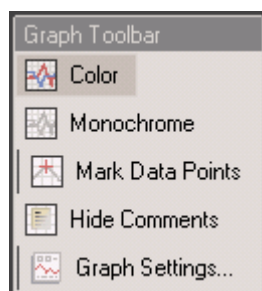
6.7.1.1 File

The File Toolbar has icons allowing you to [Save](#) or [Print](#) the graph. It also includes the [Copy](#) icon.



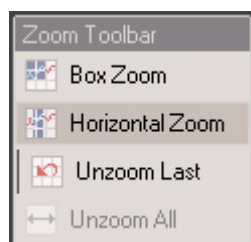
6.7.1.2 Graph

The Graph Toolbar has icons allowing you to select a [Color](#) or [Monochrome](#) display of the graph, [Mark Data Points](#), and [Hide Comments](#).



6.7.1.3 Zoom

The Zoom Toolbar has icons allowing you to select a [Box](#) or [Horizontal](#) style of zoom or zoom to a region by selecting the date and time. If you have already zoomed in, you can also click on icons allowing you to [Unzoom Last](#) and [Unzoom All](#).



6.7.2 Status Bar

If the Status Bar is enabled, it will show the current coordinates of the mouse. The X-coordinate will reflect the date and time while the Y-coordinate will reflect the unit values of the Y-axis.

6.7.3 Maximize Table

Selecting Maximize Table from the View Menu will allow you to hide the graph and only display the data table or statistics on the screen.

6.7.4 Split View

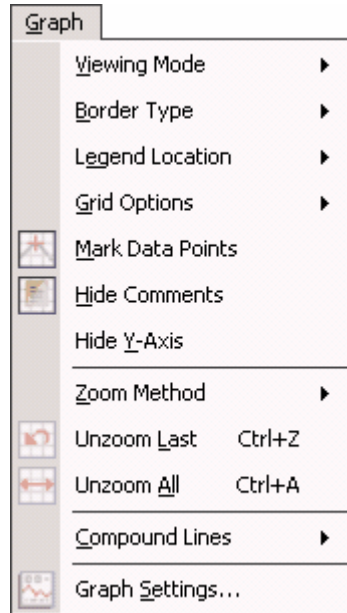
Selecting Split View from the View Menu will allow you to restore the display with the graph shown in the upper part and the data table in the lower part of the screen.

6.7.5 Maximize Graph

Selecting Maximize Graph from the View Menu will allow you to hide the data table and statistics and only display the graph on the screen.

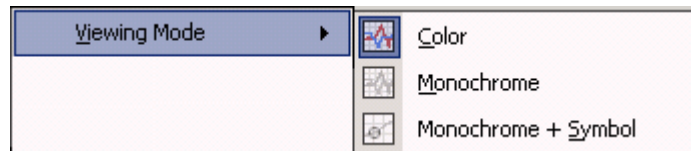
6.8 Graph Menu

The Graph Menu provides access to functions allowing the user to customize the graph. While you can select some functions directly from the menu, others are selected from sub-menus. To set how you want graphs to appear, you can select from [Viewing Mode](#), [Border Type](#), [Legend Location](#), [Grid Options](#), [Mark Data Points](#), [Hide Comments](#), and [Hide Y-Axis](#). To select what is shown in the display you use [Zoom Method](#), [Unzoom Last](#), and [Unzoom All](#). Select [Compound Lines](#) to work with lines that are created from graph data. [Graph Settings](#) allow you to access both general graph features and advanced channel features.



6.8.1 Viewing Mode

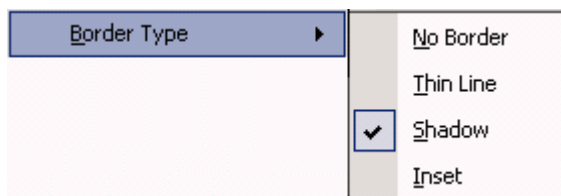
The Viewing Mode Menu enables you to select if the graph is displayed in color. Color works best if you are viewing the graph on the monitor or have a color printer. Selecting Monochrome or Monochrome + Symbol (which displays symbols, grid lines, and legends) works best for printing in black and white. Note that there are only 12 unique symbols, so the symbols will be repeated if you have more than 12 lines.



The Viewing Mode properties can also be set from the [Styles Tab](#) of the Graph Settings Dialog Box and the [Graph Toolbar](#).

6.8.2 **Border Type**

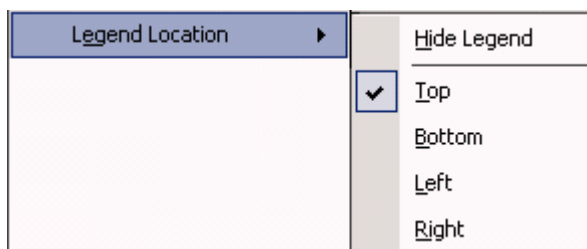
The Border Type Menu enables you to define how the border of the graph is displayed. The options available are: No Border, Thin Line, Shadow and Inset.



The Border Type properties can also be set from the [Styles Tab](#) of the Graph Settings Dialog Box.

6.8.3 **Legend Location**

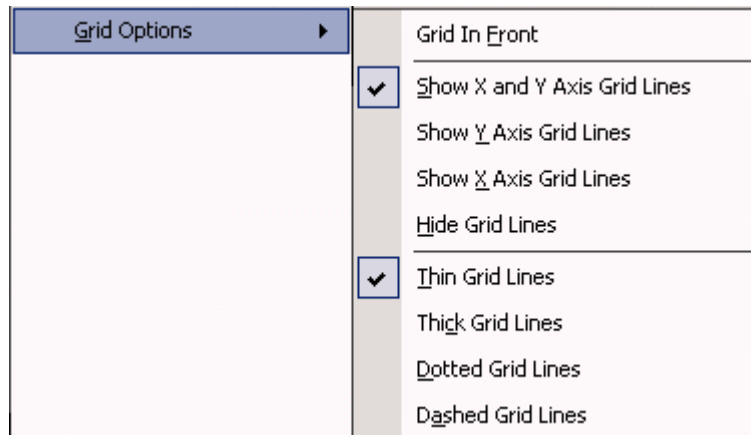
The Legend Location Menu enables you to select if a legend is displayed and where it is displayed in relation to the graph. The options available are: Hide Legend, Top, Bottom, Left, and Right.



The Legend Location properties can also be set from the [Styles Tab](#) of the Graph Settings Dialog Box.

6.8.4 Grid Options

The Grid Options Menu enables you to select which grid lines are displayed and how they are displayed. The options available for displaying the grid lines are: Grid in Front, Show X and Y Axis Grid Lines, Show Y Axis Grid Lines, Show X Axis Grid Lines, Hide Grid Lines. The options available for the style of grid lines are: Thin Grid Lines, Thick Grid Lines, Dotted Grid Lines, and Dashed Grid Lines.



The Grid Options can also be set from the [General Tab](#) of the Graph Settings Dialog Box.

6.8.5 Mark Data Points

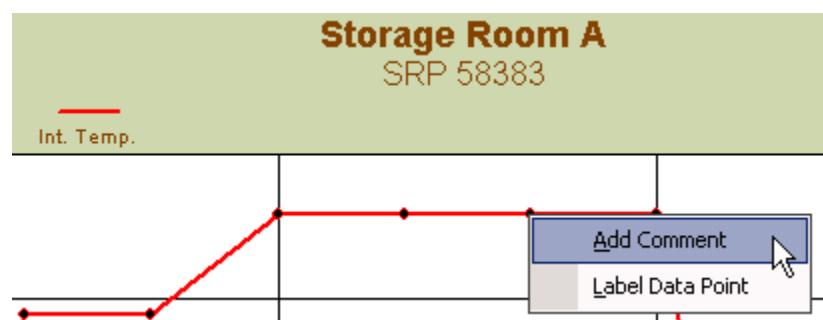
Selecting Mark Data Points will place a small dot on each data point in the graph. Mark Data Points can also be set from the [General Tab](#) of the Graph Settings Dialog Box and the [Graph Toolbar](#).

6.8.6 Comments

Data points in the graph can be annotated with comments. When the mouse is moved over a data point on the graph, the pointer will change shape. You can then right-click to pop up a menu. This menu allows you to add, edit, move, and remove comments. You can also add general comments to the graph or label data points.

Add Comment - Data Point

1. Right-click on the data point to pop up the menu and select **Add Comment**.



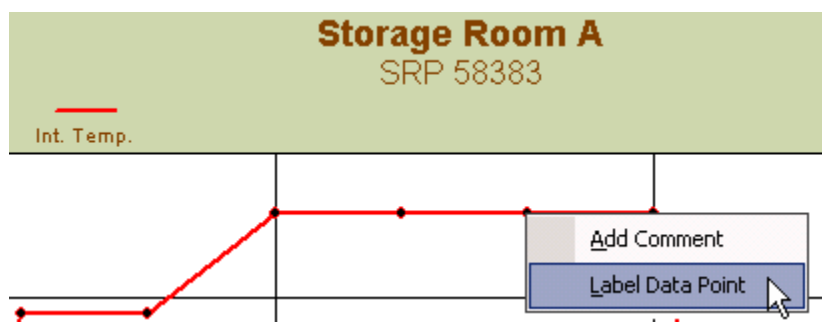
2. Type the comment and click **OK**.



If data points from two different lines are plotted at the same location on the graph, you can only add a comment for one of the lines. If you want to add a comment to the other line, temporarily hide the first line (see the [Lines Tab](#) of the Graph Settings Dialog Box), add the comment, and then show the first line.

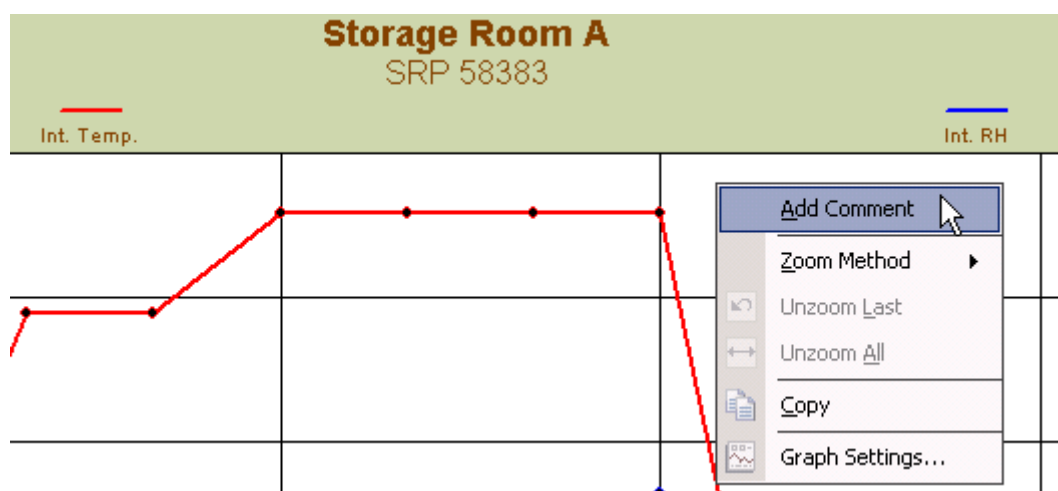
Label Data Point

To label a data point, right-click on the data point and select **Label Data Point**.

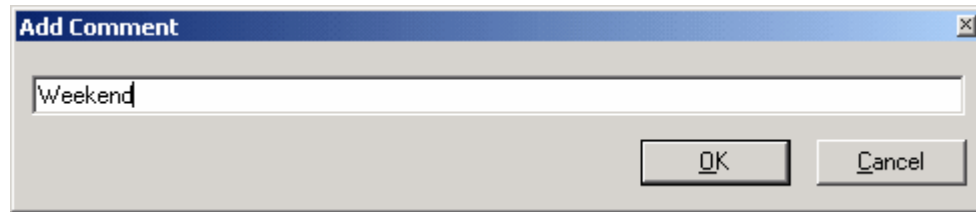


Add Comment - General

1. Right-click on an empty area of the graph and select **Add Comment**.

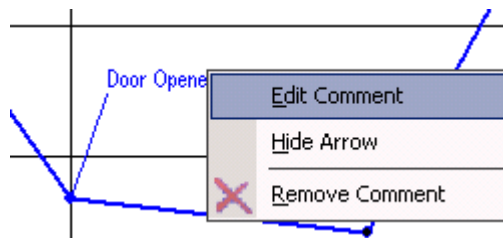


2. Type the comment and click **OK**.

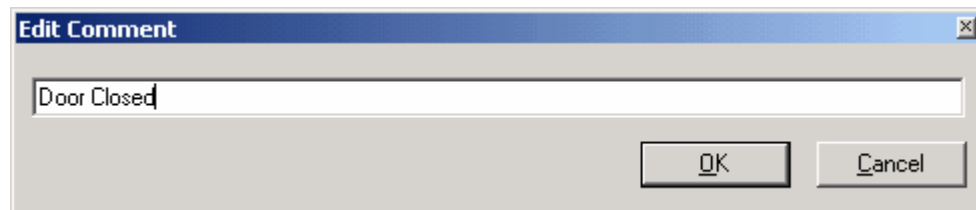


Edit Comment

1. Right-click on the data point or the comment itself to pop up the menu and select **Edit Comment**.



2. Click in the text field and modify the comment. Click **OK**.



Remove Comment

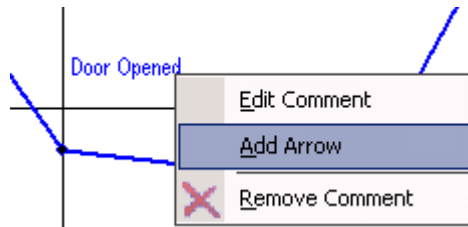
To remove a comment, right-click on the data point or the comment and select **Remove Comment**.

Move Comment

To move a comment around, simply click on the comment and drag the mouse to the new position.

Arrows

When a data comment is created, an arrow between the comment and the data point is also created. From the pop up menu, you can select **Hide** or **Add Arrow** depending on whether the arrow is already shown.



Hide Comments

Selecting **Hide Comments** from the Graph Menu will hide all comments on the graph. You will not be able to add new comments or edit existing comments if Hide Comments is selected. Hide Comments can also be set from the [General Tab](#) of the Graph Settings Dialog Box and the [Graph Toolbar](#).

6.8.7 Hide Y-Axis

Selecting Hide Y-Axis will hide the Y-Axis division markings and units. Hide Y-Axis can also be set from the [General Tab](#) of the Graph Settings Dialog Box.

6.8.8 Zoom Method

The zoom function allows you to magnify a section of the graph in order to see it in greater detail. The Zoom Method Menu is used to select the style of the zoom and also if you want to zoom in on specific dates and times. After zooming, if you want to revert back to previous displays, use [Unzoom Last](#) or [Unzoom All](#).

The Zoom Method Menu enables you to select the zooming style to use. Selecting Box Zoom will allow you to zoom in on both axes. Selecting Horizontal Zoom will allow you to zoom in only on the X-axis, showing the entire Y-axis. The Zoom properties can also be set from the [Styles Tab](#) of the Graph Settings Dialog Box, the [Zoom Toolbar](#) or by right-clicking while the pointer is over the graph.

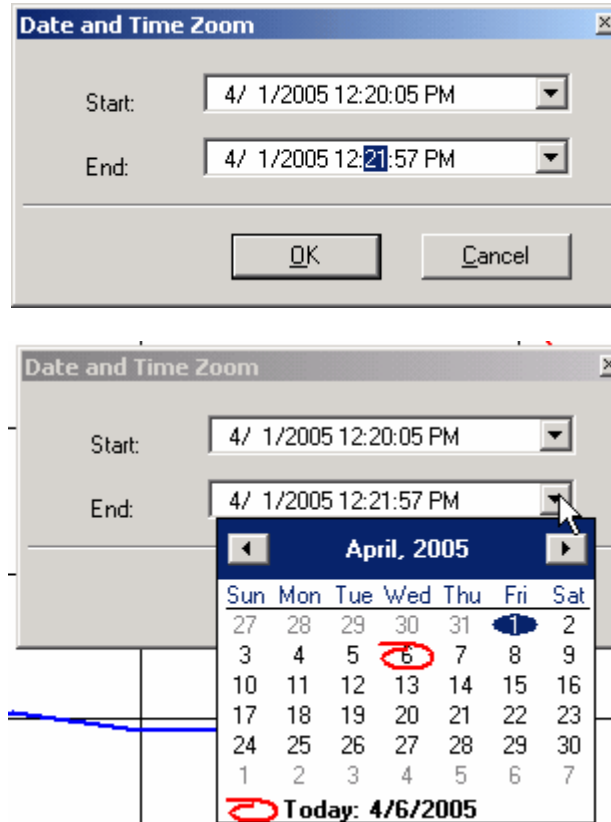


How to Zoom Using the Mouse

1. To zoom in on a selected portion of the graph, move the pointer to the start (or end) of the region of interest. Before you zoom, ensure that the pointer is in an empty area of the graph, such as above the data bars in a bar graph.
2. Click and drag the mouse to the other end of the region of interest.
3. Release the button to display the selected region.

How to Zoom Using the Menu

Selecting Date and Time from the Zoom Method Menu will allow you to zoom in to a specific time period. A window appears that allows you to enter the date and time for both the start and end of the zoom area. You can either type in the date or pull down the list to pop up a calendar. Note that the format for the date and time depends on your Windows settings and can be set in the Regional Settings of the Control Panel.



6.8.9 **Unzoom Last**

Unzoom Last will restore the display to the last zoom setting. Unzoom Last can also be selected from the [Zoom Toolbar](#) or by right-clicking while the pointer is over the graph.

6.8.10 **Unzoom All**

Unzoom All will set the display to show the entire graph. It will also restore the scaling of the Y-axis if it was changed when zooming in. Unzoom All can also be selected from the [Zoom Toolbar](#) or by right-clicking while the pointer is over the graph.

6.8.11 Compound Lines

A compound line is a graph line that is made from data from one or more other graph lines. An example would be calculating power by multiplying a measured current with a measured voltage. In order to [Add a Compound Line](#), you must first create a custom equation for a compound line. Please refer to the Equations section to learn how to create a compound line equation.

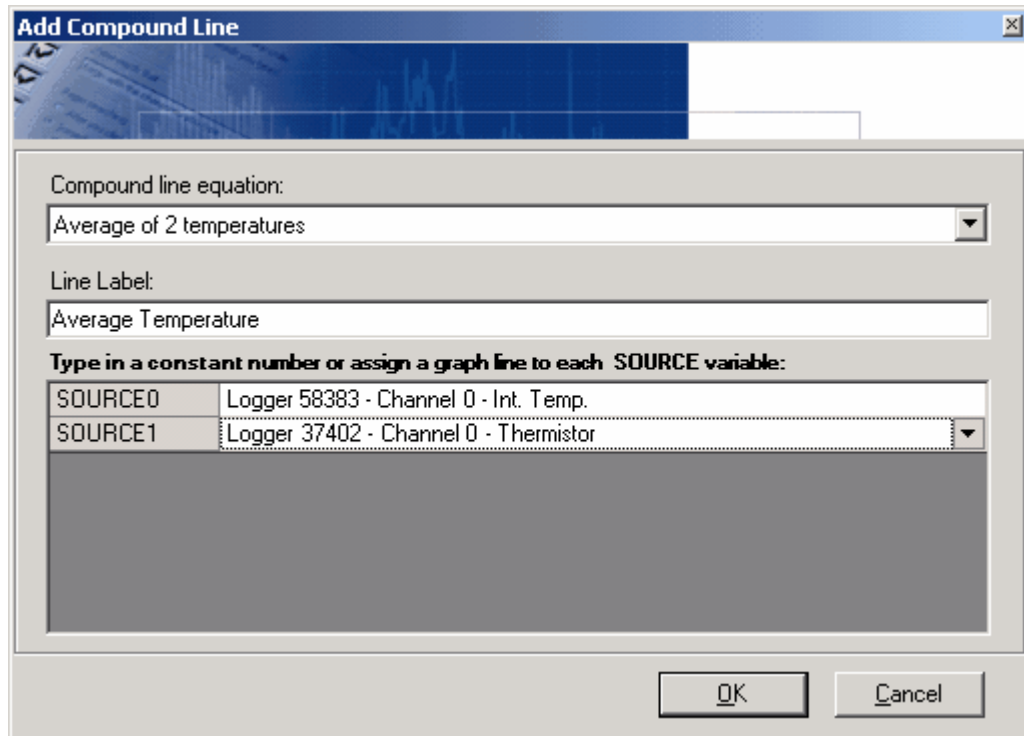


When you create a compound line equation, you specify what the output unit will be. If you apply a compound line and then change the units, the results may be invalid. For example, if you have a compound line equation that takes the average of 2 temperatures and outputs in °C, it is expected that the input sources will also be in °C. If your data is shown in °C, the results are valid but if you change the display to °F, the results will be invalid.

6.8.11.1 Add A Compound Line

The compound line equation must already be defined and the sources of data will be either channels in the graph or constant values. The compound line will be added to the data table and the statistics as well as being displayed on the graph. It is recommended that you create the compound line when the entire graph is displayed, otherwise the compound line will only apply to the data in the zoomed area. Note that if your graph has data from multiple files that are separated in time, the compound line will not be drawn across the gap.

1. Select the Compound Lines Menu and then select **Add Compound Line**. This will pop up an input form.
2. Select an Equation from the drop-down list.
3. Enter a Description for the compound line to appear in the Legend box
4. Select the Sources of Data for the Equation Variables. You can enter a numerical value or select a graph channel from the drop-down list. All the sources must be entered.
5. Click **OK**.



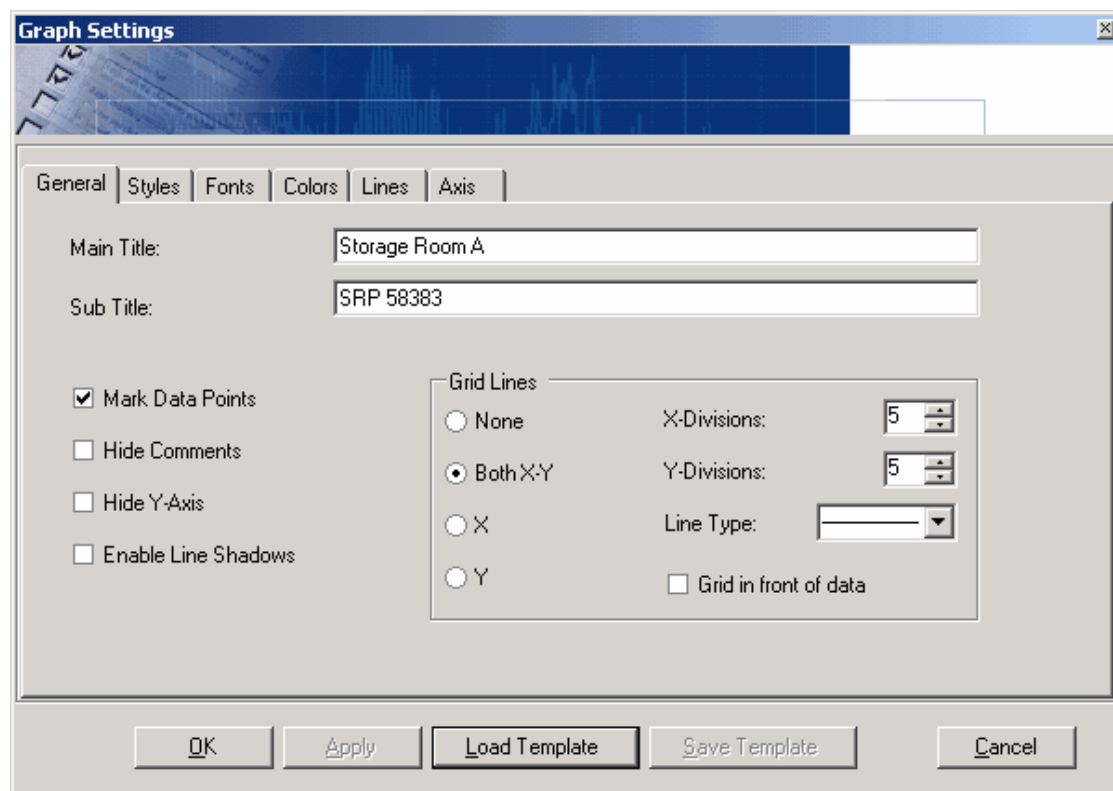
6.8.11.2 Remove Compound Lines

Select the Compound Lines Menu and then select Remove Compound Lines to remove all compound lines from the graph, data table, and statistics. Note that removing compound lines can not be undone.

6.8.12 Graph Settings

The Graph Settings window enables you to configure both common and advanced graph features. The features are grouped together into the following tabs: [General](#), [Styles](#), [Fonts](#), [Colors](#), [Lines](#), and [Axis](#). Click on the appropriate tab to show the features. You can also right-click while the pointer is over the graph to pop a menu to select Graph Settings.

To configure graphs with identical settings, you can use templates. Templates for the graph can be loaded or saved. See [Templates](#) for a detailed description.

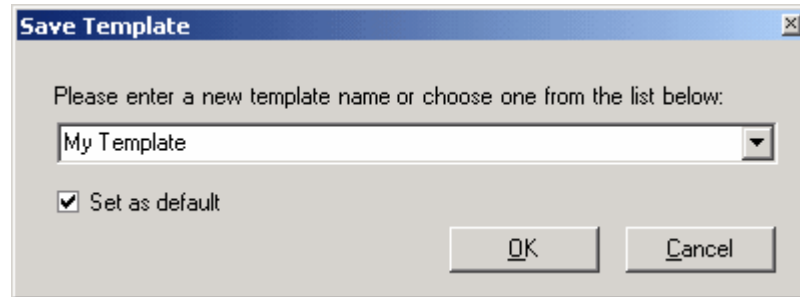


6.8.12.1 Templates

A template contains all the properties of a Graph Settings window. You use templates, like style sheets, to apply a group of settings to a graph. For example, suppose that you wanted to differentiate temperature loggers that were on the first floor from those on the second. You could create a template with a red spline line for loggers from the first floor, and another template with a blue ribbon line for loggers from the second floor. You would then simply apply the appropriate template, saving you from manually entering the changes for each graph. Note that the default template settings are applied to the graph when a logger is backed up. You can manage templates in the Preferences.

Save Templates

1. To save a group of settings so you can apply them to other graphs, click on **Save Template**.
2. In the window that pops up, enter the name of a new template or, if you want to overwrite an existing template, select it from the drop-down list.
3. If you want to set this template to be the default, click on the box beside **Set as Default**.
4. Click **OK**.

**Load Templates**

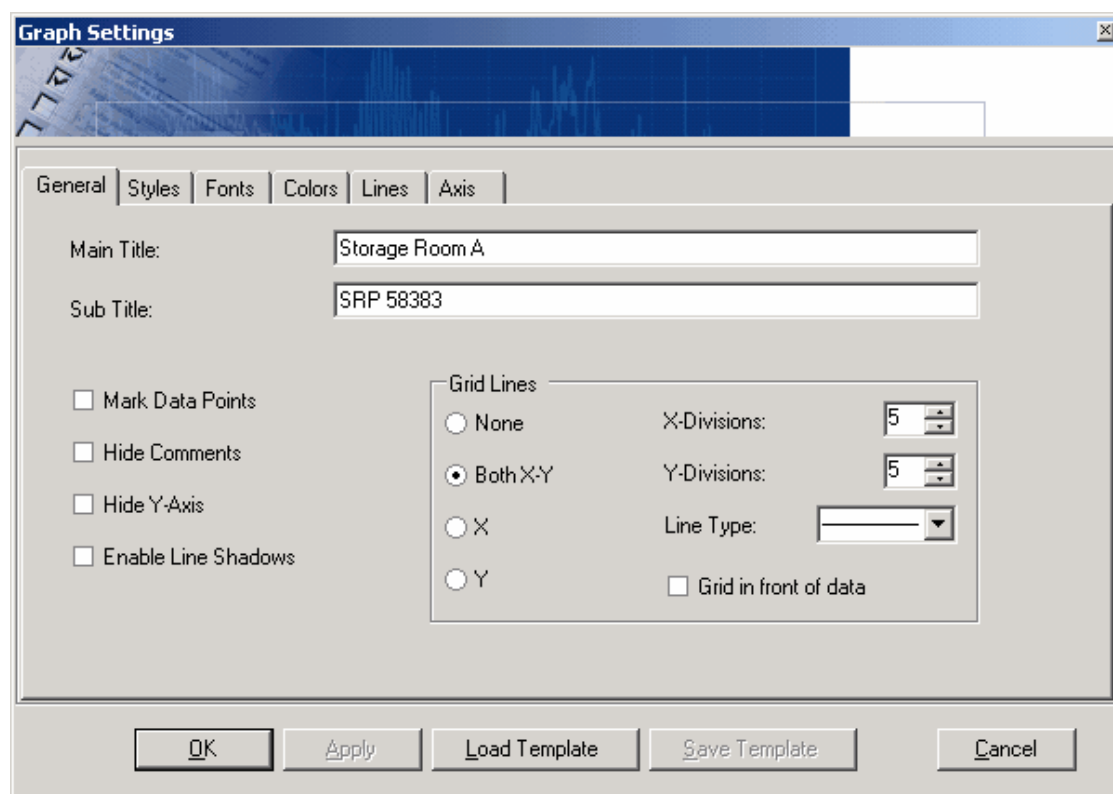
1. To load previously saved settings to the graph, click on **Load Template**
2. In the window that pops up, select the name from the drop-down list.
3. Click **OK**.

6.8.12.2 General Tab

The General Tab enables you to set features that apply to the entire graph. You can change the following:

1. Enter the Main and Sub Titles by highlighting the title and typing the new title.
2. Enable and disable Mark Data Points, Hide Comments, Hide Y-Axis, and Enable Data Shadows by clicking in the box beside the feature.
3. Choose which grid lines, if any, that you want to display by clicking on the appropriate radio button.
4. Choose the number of divisions for both the X and Y axes by either using the up/down buttons or by highlighting the number and entering the new one.
5. Choose the grid line type from the drop-down list and you can choose whether you want to display the grid in front of the graph data.

6. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.



See also:

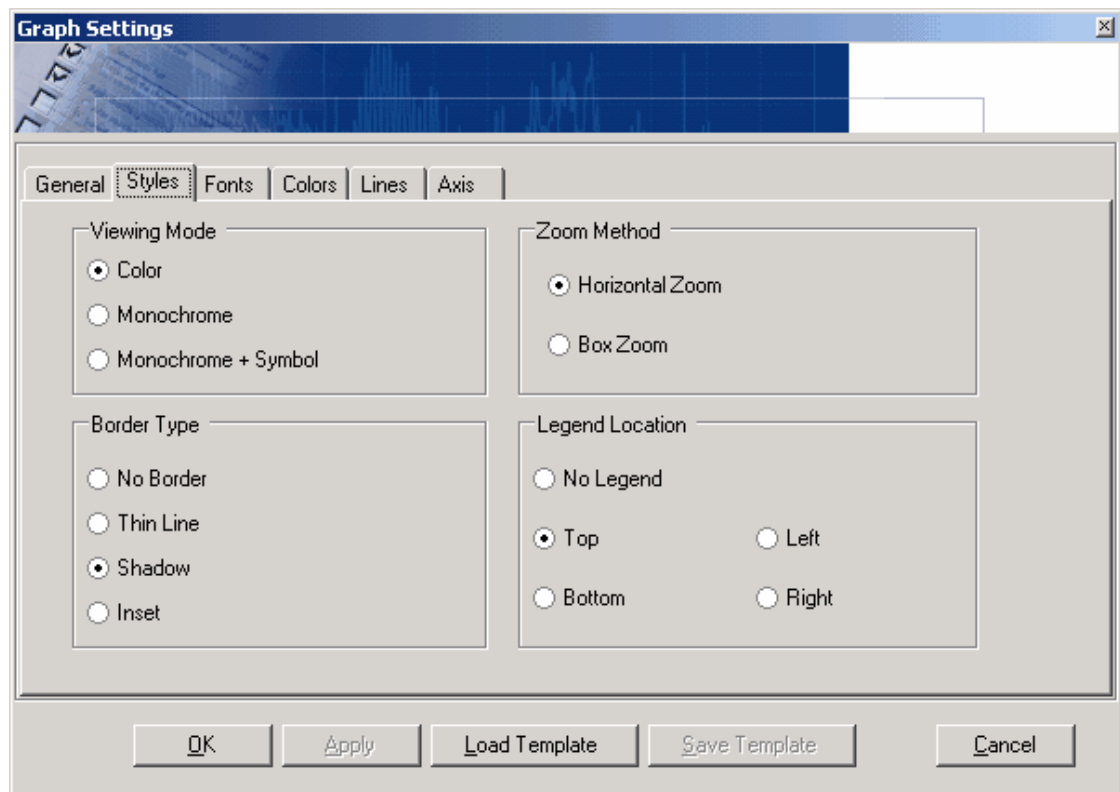
[Mark Data Points](#)
[Comments](#)
[Hide Y-Axis](#)
[Grid Lines](#)

6.8.12.3 Styles Tab

The Styles Tab enables you to set style features that apply to the entire graph. You can change the following:

1. Choose how you want to display the graph by clicking on the appropriate radio button in the Viewing Mode section.
2. Choose how you want the graph border to appear by clicking on the appropriate radio button in the Border Type section.
3. Choose how you want to zoom by clicking on the appropriate radio button in the Zoom Method section.
4. Choose whether you want to display the legend and where to display it by clicking on the appropriate radio button in the Legend Location section.

5. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.

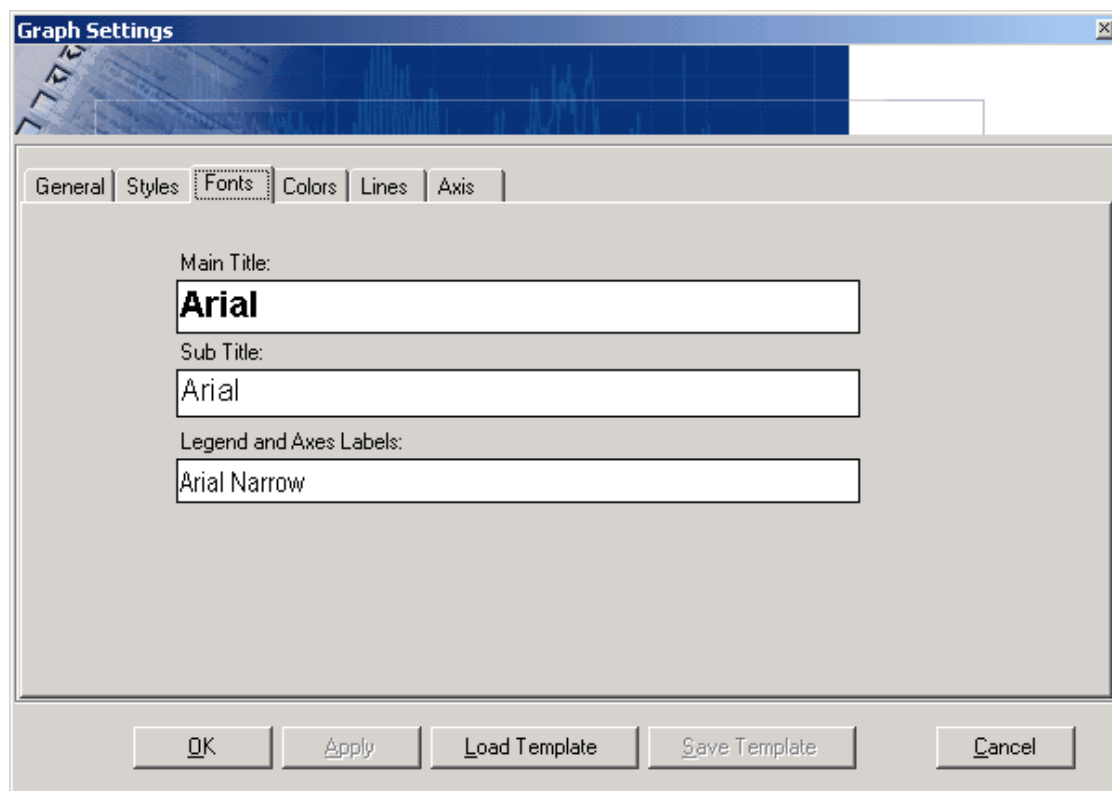


See also:

[Viewing Mode](#)
[Border Type](#)
[Zoom Method](#)
[Legend Location](#)

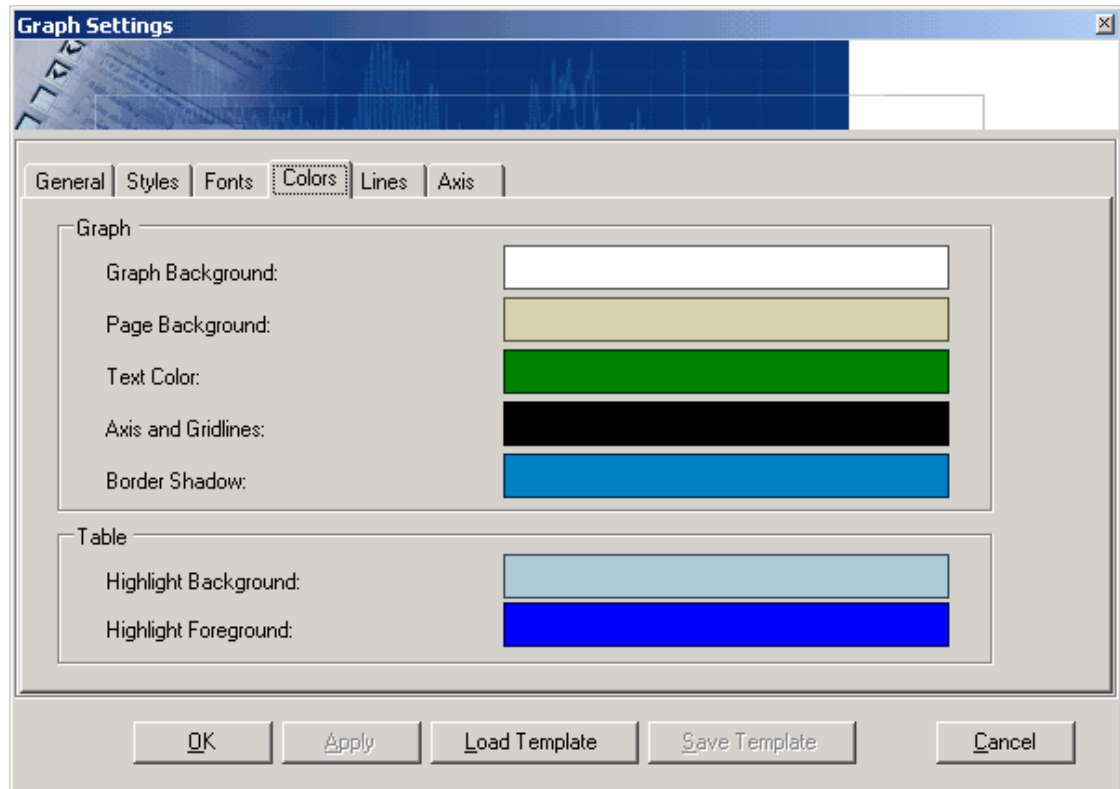
6.8.12.4 Fonts Tab

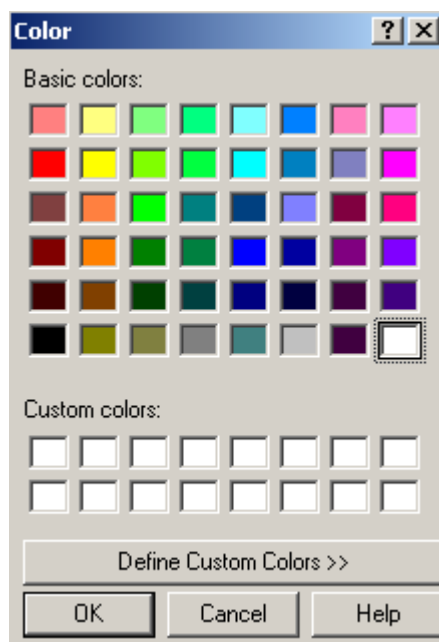
The Fonts Tab enables you to select the fonts used in different sections of the graph. To change a font, simply click on the font name to pop up a standard font window. The description to the left of a font name indicates where that font will be applied. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.



6.8.12.5 Colors Tab

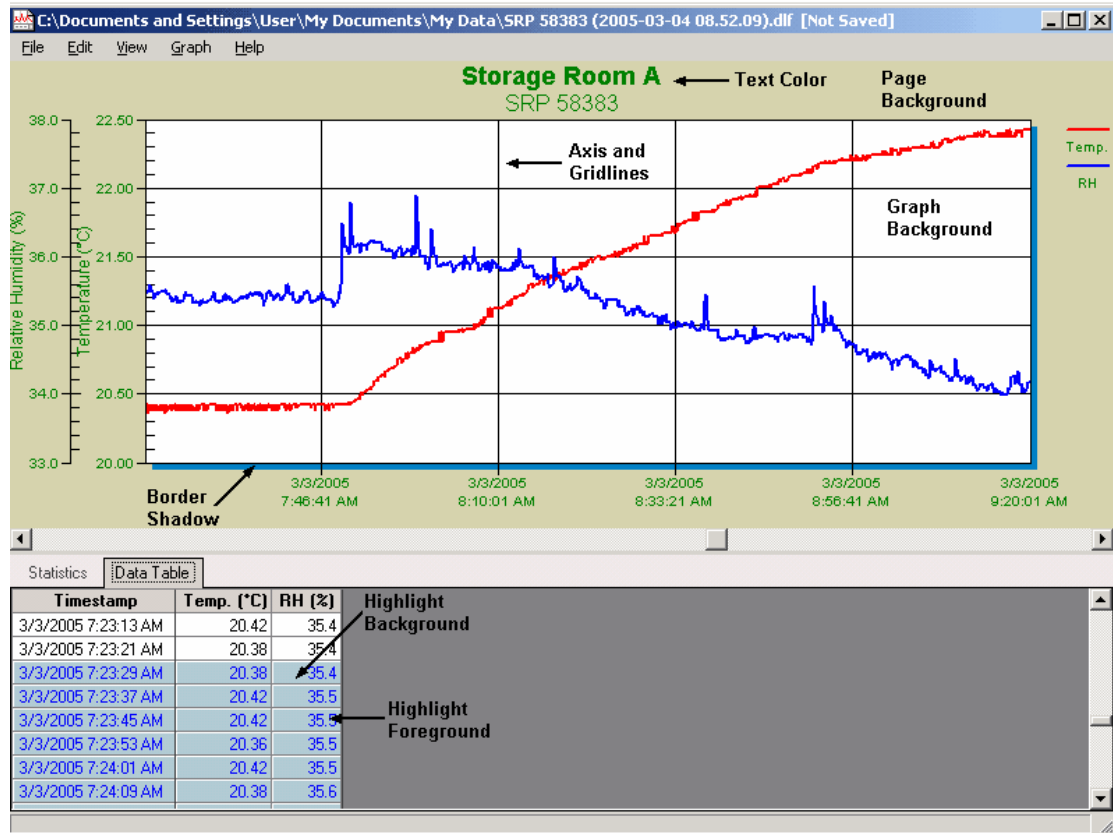
The Colors Tab enables you to select the colors of different elements of the graph and data table. To change a color, simply click on the colored box to pop up a standard color picker. The description to the left of a color name indicates where that font will be applied. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.





1. The Graph Background is the color of the rectangular area of the actual graph data lines.
2. The Page Background is the color of the area around the graph.
3. The Text color is applied to the title, sub-title, legend, and axes text.
4. The Axis and Gridlines color is applied to the axes division markers and to the grid lines.
5. The Border Shadow is the color of the shadow around the border of the graph.
6. The Highlight Background is the color of the highlighted cells of the data table.

7. The Highlight Foreground is the color of the highlighted numbers in the data table.

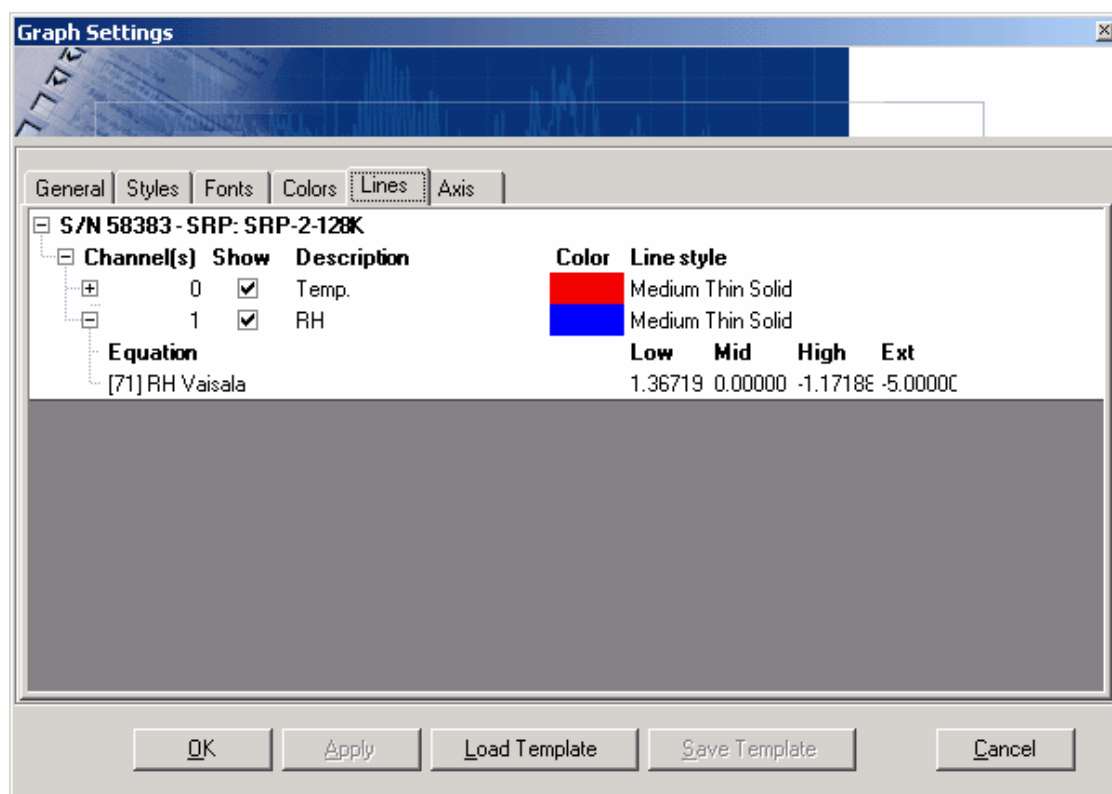


6.8.12.6 Lines Tab

The Lines Tab enables you to set the characteristics of the individual graph lines, including compound lines. You can choose to show or hide information in a section, such as a channel number, by clicking on the box beside the section title. If the information is already shown, the "-" will then change to a "+" and the section will be collapsed. Click on the "+" again to display the section. You can change the following:

1. Click on the box in the Show column to toggle the line on and off.
2. To change a line's description, click on the description you want to change and type the new name. When finished, press **Enter** or click elsewhere in the window. The description is used to reference the line in the legend.
3. To change the color, first click on the color. A small grey box will appear at the right side. Click on this box to pop up a standard color picker.
4. To change the style of a line, first click on the line style. A drop-down list will appear, offering you a choice of line styles.
5. To change the equation of a line, first click on the equation. A drop-down list will appear, offering you a choice of equations.
6. To change a calibration value, either Low, Mid, High, or Ext, click on the value and type the new value. When finished, press **Enter** or click elsewhere in the window. Note that all the calibration values may not be used and these calibration values apply only to the graph and do not affect the data logger settings.

- To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.

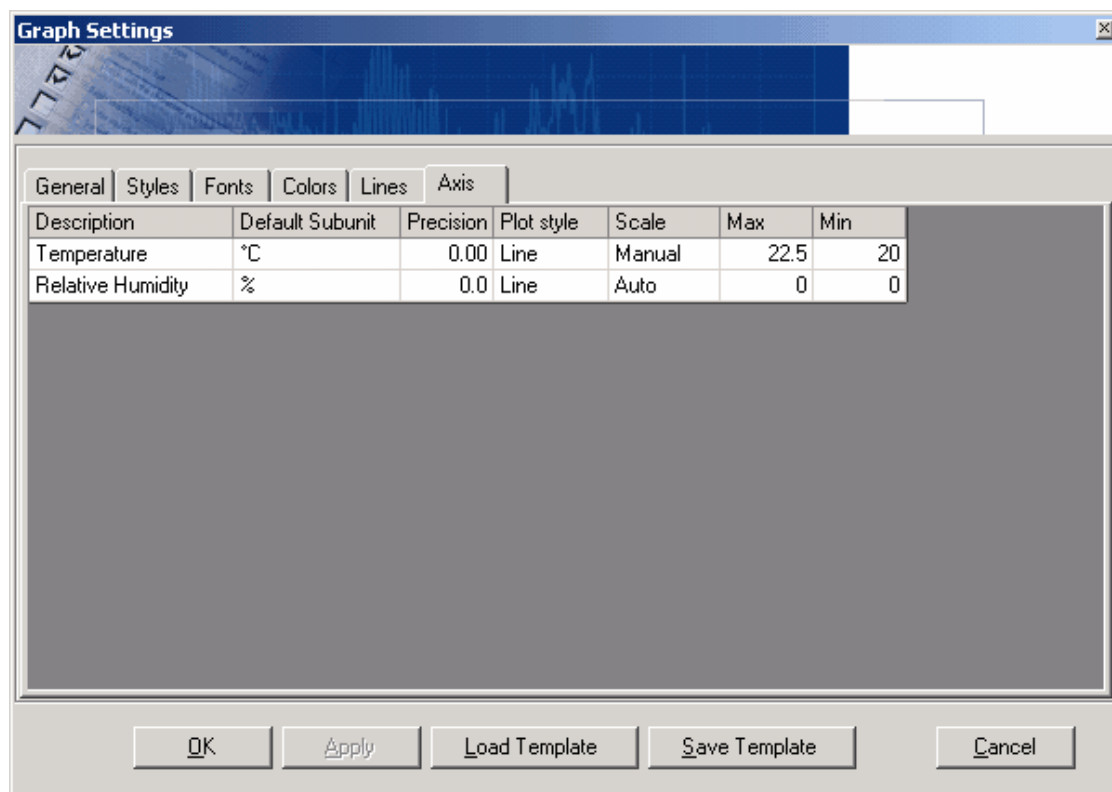


6.8.12.7 Axis Tab

The Axis Tab enables you to set the characteristics of the graph axes. The axis description cannot be changed. You can change the following:

- To change the default sub unit, first click on the sub unit. A drop-down list will appear, offering you a choice of sub units.
- To change the precision, first click on the precision. A drop-down list will appear, offering you a choice for precision. Note that the precision affects the display of numbers on the graph, in the data table and in the statistics.
- To change the style with which the data is displayed, first click on the plot style. A drop-down list will appear, offering you a choice of styles.
- To change the scaling, first click on the scale. A drop-down list will appear, offering you a choice of auto or manual. If you select Auto, no other input is required. If you select Manual, then you need to enter the Maximum and Minimum values. Note that if you change the default subunit, from °C to °F for example, the graph axis will adjust appropriately if you have selected Auto scaling but not with Manual scaling.
- To enter a maximum or minimum value for the scaling, click on the value and type the new value. When finished, press **Enter** or click elsewhere in the window.

6. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other properties.



SECTION 7 Equations

7.1 **Introduction to Equations**

The data logger records readings in a raw data form. TrendReader Standard 2 uses equations to transform the raw data into meaningful, measurable units such as °C, volts or PSI (pounds per square inch). There are numerous standard equations that are built into TrendReader Standard 2. You can refer to your particular logger's guide to determine which equations are appropriate.

These standard equations will normally be all that you need to get the information you want. However, there can be situations in which no standard equation suits your purpose. In these cases, you would need to create a custom equation. You use the [New Equation Wizard](#) to create custom equations. Besides creating new equations, the following sections show you how to [Edit](#), [Import](#), [Export](#), and [Delete](#) equations. See the [Compound Line Wizard](#) if you want to manage compound lines.

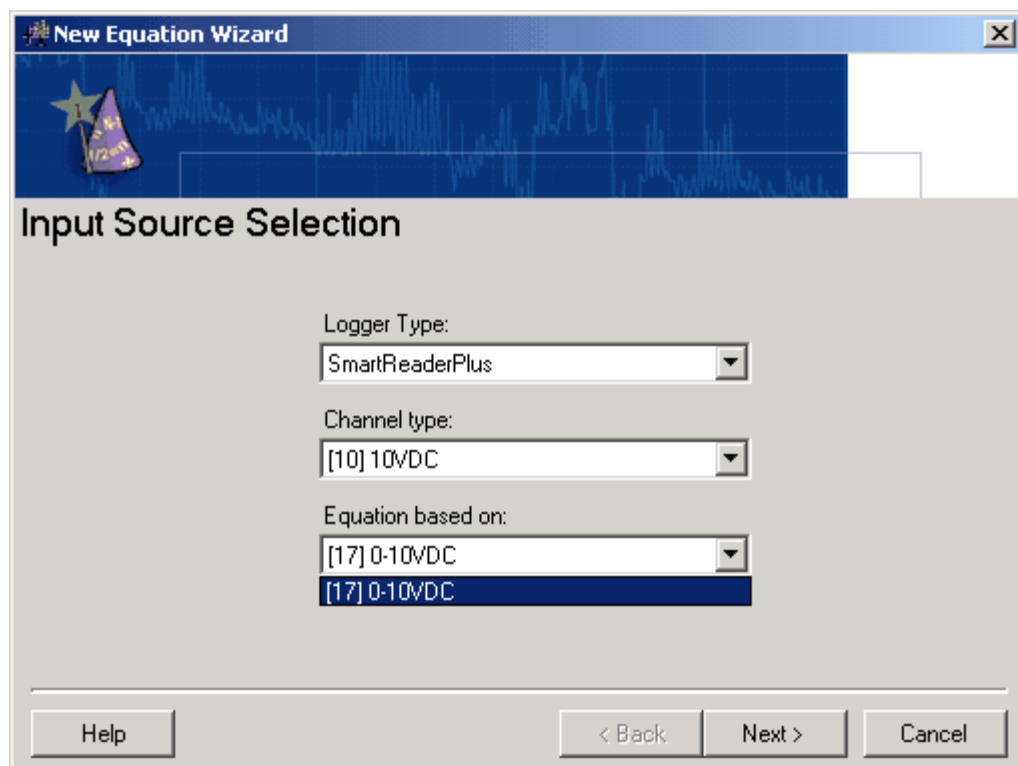
7.2 **New Equation Wizard**

By selecting the New Equation Wizard in the Equations Menu, you can create new custom equations. The wizard takes you through the steps required to create the equation.

7.2.1 **Input Source**

In the first step of the wizard, you select what logger and channel type the equation is specified for.

1. Click on the drop-down list to select the logger type.
2. Click on the drop-down list to select the channel type.
3. Select the source equation that you want your equation to be based upon. For example, if you are creating a custom equation for a pressure transducer that outputs voltage, you would select a voltage source equation.



7.2.2 **Output Unit**

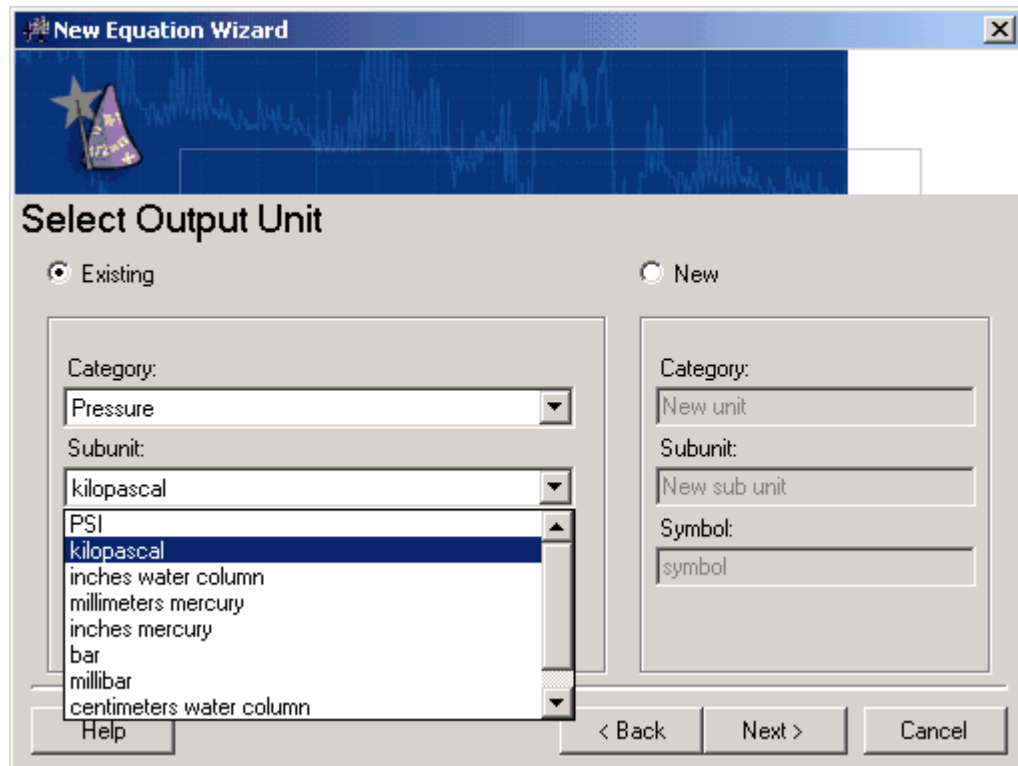
In the second step of the wizard, you select the units for the new equation. You can select a Unit Category that is already in the system or you can create a new one.

Unit in the System

1. Click on the drop-down list to select the Unit Category. For example, for a pressure transducer equation, you would select Pressure.
2. Click on the drop-down list to select the Subunit. For example, for a pressure transducer equation, you could select kilopascal.

New Unit

1. Enter the Unit Category.
2. Enter the Subunit. This will be used as the main Subunit.
3. Enter the Symbol for the Subunit.



7.2.3 **Equation Type**

In the third step of the wizard, you select what type of equation to create. If you select either a Linear, Polynomial, or Thermistor equation, TrendReader Standard 2 will create an equation for you based on data that you enter. Select Empty if you want to use your own formulas to write an equation.

A linear equation, as the name implies, represents a straight line where the output is an offset added to a multiple of the input, typically shown as $Y = m \cdot X + b$. The most common use of a linear equation is with a linear output transducer that measures a phenomenon (for example, wind speed, power, or acidity) and produces an electrical signal in proportion to that phenomenon.

A polynomial equation, represents a line that is the sum of coefficients that are multiplied by powers of the input, typically shown as $Y = a_0 + a_1 \cdot X + a_2 \cdot X^2 + a_3 \cdot X^3 + \dots$. The order of the polynomial represents the highest order of power.

A thermistor equation, as the name implies, will create an equation for a thermistor temperature sensor. The equation is in the form a Steinhart-Hart equation, which is generally acknowledged as the best equation available for making the thermistor response curve linear. The basic form of the equation is as follows:

$$1/T = A + B*(\ln R) + C*(\ln R)^3$$

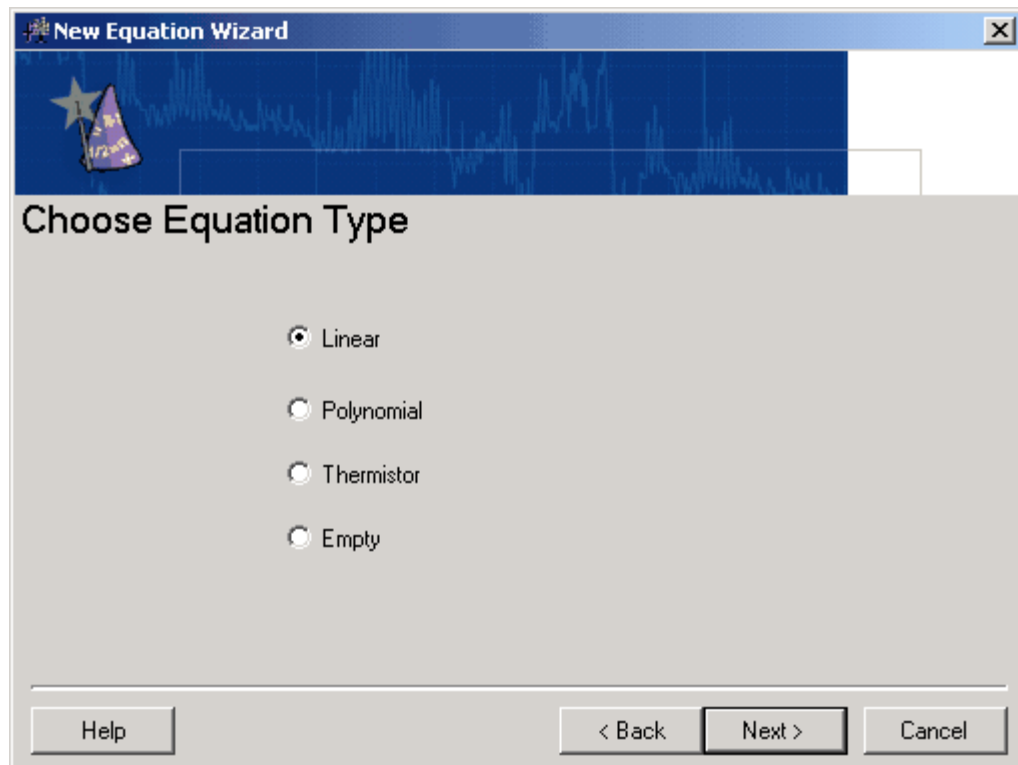
where:

T = temperature in degrees Kelvin (degrees Celsius + 273.15)

LnR = natural logarithm of the resistance of the thermistor (in ohms)

A, B, C = curve-fitting constants derived from measurement

Note that thermistor equations are created only for NTC (negative temperature coefficient) thermistors.



Empty Equation

If you want to enter in your own specific formula, and not have TrendReader Standard 2 create an equation, select Empty Equation. This will create a shell for your equation. When the wizard is completed, you will be taken to the editor window where you can enter in your formula. For help on equation coding and examples, refer to [APPENDIX A Equation Language](#).

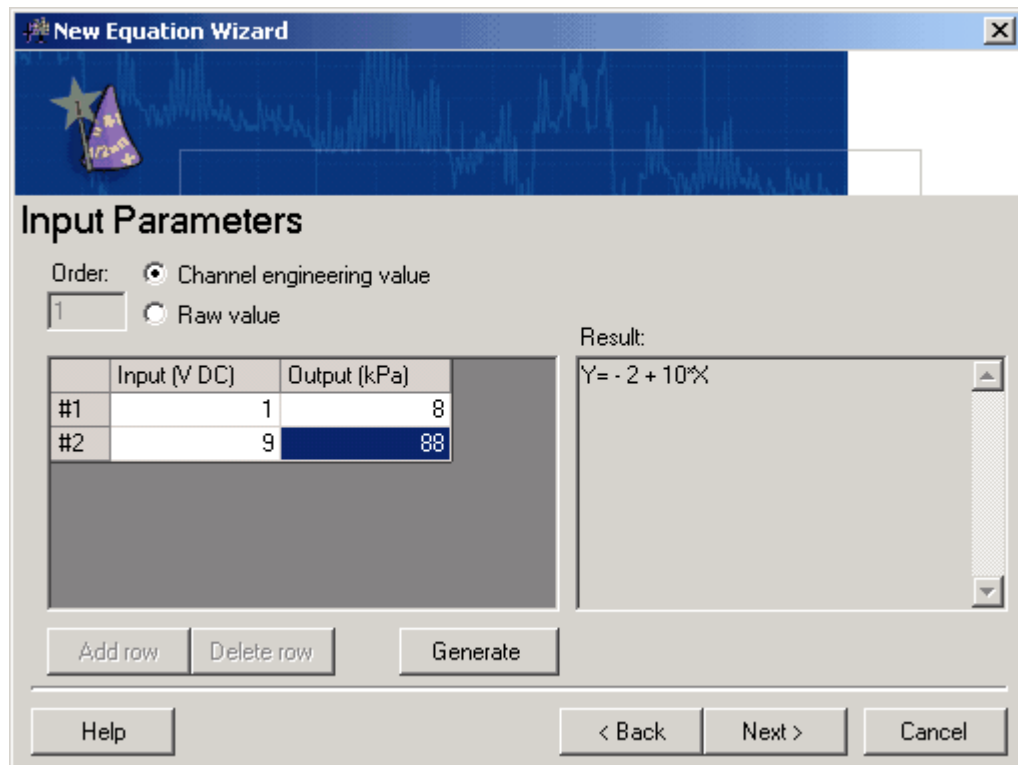
7.2.4

Parameters

In the fourth step of the wizard, you enter the measurements you recorded or obtained from a specification sheet to generate the equation. Note that this step is omitted if you selected an Empty Equation.

Linear Equation

1. Choose whether you want to use the engineering value or a raw value for the input. For the pressure transducer example, you would select Channel engineering value as you would be entering voltages and corresponding pressures. If you select Raw value, the equation will use the input byte count, not the calculated engineering value.
2. Enter the first input value and its matching output.
3. Enter the second input value and its matching output.
4. Click on **Generate** to create the equation.



The "New Equation Wizard" dialog box is shown. It has a title bar with a close button. Below the title bar is a decorative blue header with a star and a small graph. The main section is titled "Input Parameters". It contains two radio buttons: "Channel engineering value" (selected) and "Raw value". Below these is a text box containing the number "1". To the right is a "Result:" label and a text box containing the equation $Y = -2 + 10 * X$. Below the radio buttons is a table with two columns: "Input (V DC)" and "Output (kPa)". The table has two rows: "#1" with input "1" and output "8", and "#2" with input "9" and output "88". Below the table are three buttons: "Add row", "Delete row", and "Generate". At the bottom are three buttons: "Help", "< Back", and "Next >", and a "Cancel" button.

New Equation Wizard

Input Parameters

Order: ☒ Channel engineering value
☐ Raw value

1

	Input (V DC)	Output (kPa)
#1	1	8
#2	9	88

Result:
 $Y = -2 + 10 * X$

Add row Delete row Generate

Help < Back Next > Cancel

Polynomial Equation

1. Choose whether you want to use the engineering value or a raw value for the input. For the pressure transducer example, you would select Channel engineering value as you would be entering voltages and corresponding pressures.
2. Enter the order of polynomial equation. You will need to enter at least 1 more input-output pairs than the order of the equation. For example, if you choose a 3rd order equation, you will need to enter at least 4 input-output pairs.
3. Enter the first input value and its matching output.
4. Enter the second input value and its matching output.
5. Enter the minimum number of input-output pairs required. If more rows are required, click on **Add row**. If you have added too many rows, remove them by clicking on **Delete row**.
6. Click on **Generate** to create the equation.

New Equation Wizard

Input Parameters

Order: ☒ Channel engineering value
☐ Raw value

3

	Input (V DC)	Output (kPa)
#1	1	7
#2	4	37
#3	7	58
#4	9	88

Result:

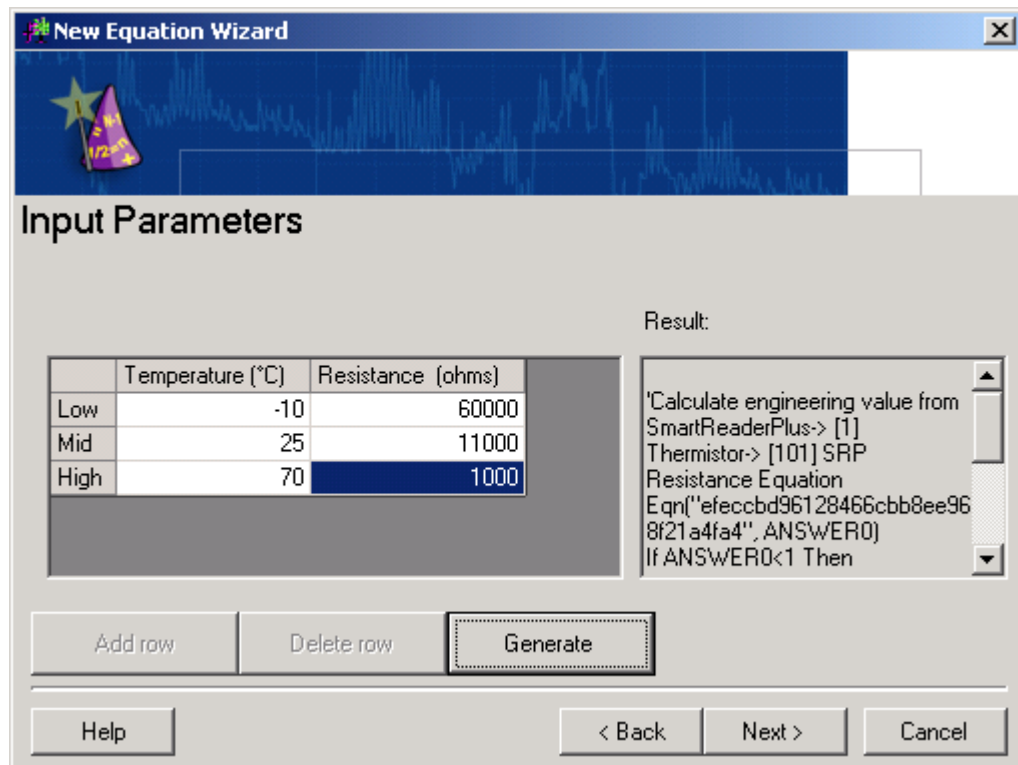
$$Y = -12.3500003814697 + 22.7374992370605X - 3.65000009536743X^2 + 0.262499988079071X^3$$

Accuracy: 100%

Buttons: Add row, Delete row, Generate, Help, < Back, Next >, Cancel

Thermistor Equation

1. Choose whether you will enter the temperature in degrees Celsius or Fahrenheit.
2. Enter the low input temperature and its matching resistance.
3. Enter the mid input temperature and its matching resistance.
4. Enter the high input temperature and its matching resistance.
5. Click on **Generate** to create the equation.



The "New Equation Wizard" dialog box features a blue header with a star and a purple cone icon. Below the header, the "Input Parameters" section contains a table with three rows: "Low", "Mid", and "High". The "Low" row has a temperature of -10°C and a resistance of 60000 ohms. The "Mid" row has a temperature of 25°C and a resistance of 11000 ohms. The "High" row has a temperature of 70°C and a resistance of 1000 ohms. To the right of the table is a "Result:" section with a text area containing the following text: "Calculate engineering value from SmartReaderPlus-> [1] Thermistor-> [101] SRP Resistance Equation Eqn('efeccbd96128466cbb8ee968f21a4fa4', ANSWER0) If ANSWER0<1 Then". Below the table and result section are three buttons: "Add row", "Delete row", and "Generate". At the bottom of the dialog are four buttons: "Help", "< Back", "Next >", and "Cancel".

	Temperature (°C)	Resistance (ohms)
Low	-10	60000
Mid	25	11000
High	70	1000

Result:

'Calculate engineering value from
SmartReaderPlus-> [1]
Thermistor-> [101] SRP
Resistance Equation
Eqn('efeccbd96128466cbb8ee96
8f21a4fa4', ANSWER0)
If ANSWER0<1 Then

Add row Delete row Generate

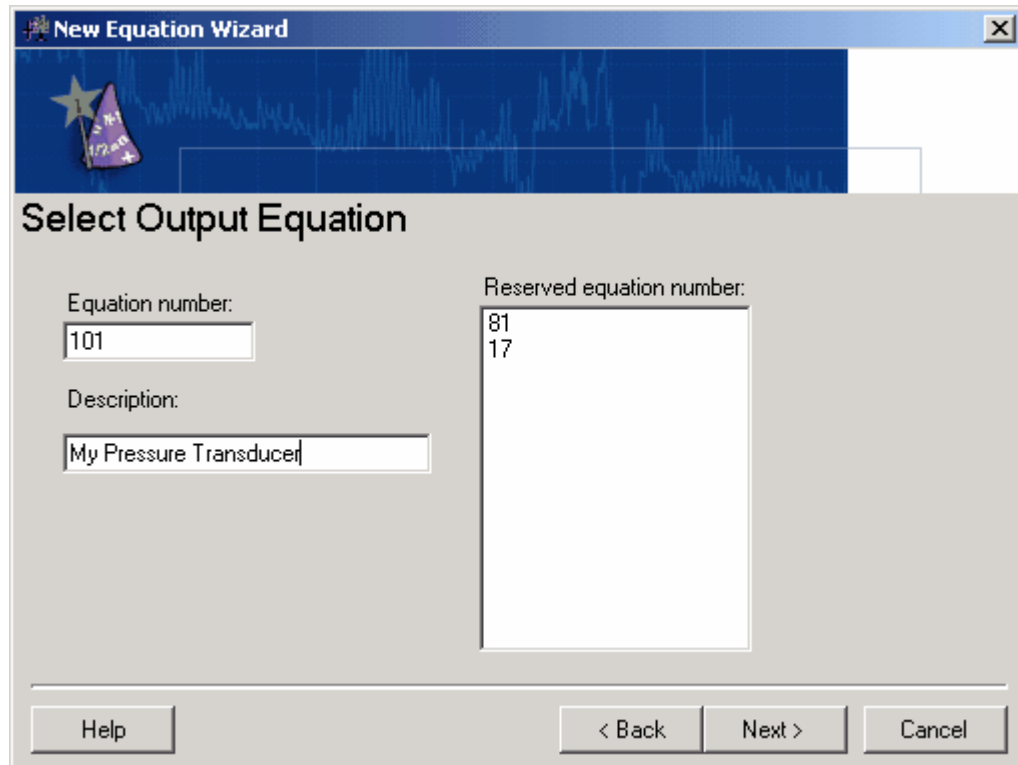
Help < Back Next > Cancel

7.2.5 Equation Information

In the fifth step of the wizard, you enter the equation number and description.

1. You will be given an available equation number. If you want a different number, highlight the equation number and enter a new one. The range of numbers is from 1 to 255. A list of equation numbers that are already reserved for the specific logger and channel type is shown.

2. Enter a description for the equation.



The image shows a 'New Equation Wizard' dialog box. The title bar is blue with a star icon and the text 'New Equation Wizard'. The main area has a blue header with a star icon and the text 'Select Output Equation'. Below this, there are two input fields: 'Equation number:' with the value '101' and 'Description:' with the value 'My Pressure Transducer'. To the right of these fields is a list box labeled 'Reserved equation number:' containing the values '81' and '17'. At the bottom of the dialog are four buttons: 'Help', '< Back', 'Next >', and 'Cancel'.

Equation number:
101

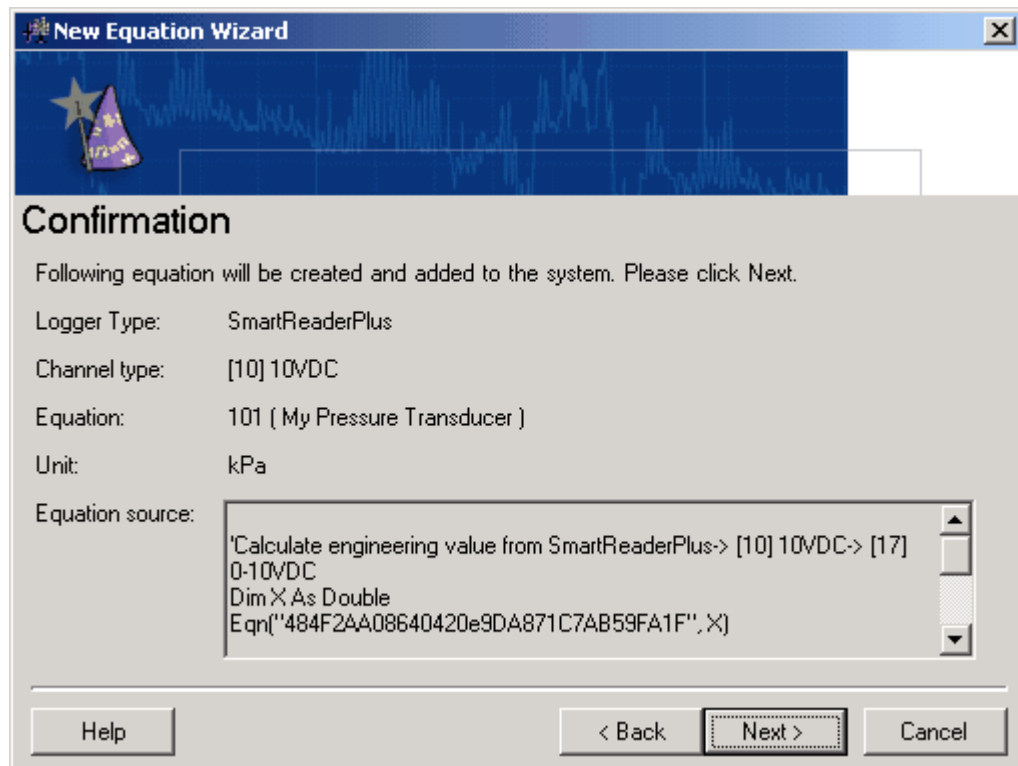
Description:
My Pressure Transducer

Reserved equation number:
81
17

Help < Back Next > Cancel

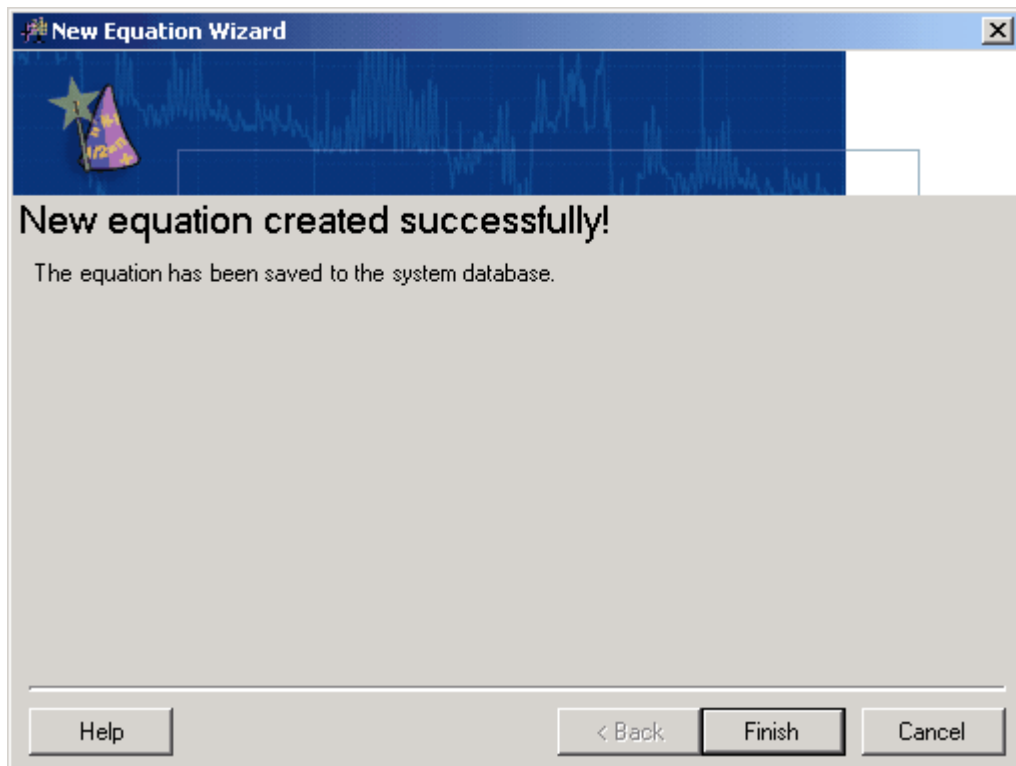
7.2.6 Confirmation

The sixth step allows you to verify that the equation you have generated is correct. If the equation is acceptable, clicking **Next** will add the equation to the system.



7.2.7**Completion**

The final step tells you that the equation was created and added to the system. Click **Finish** to complete the wizard.



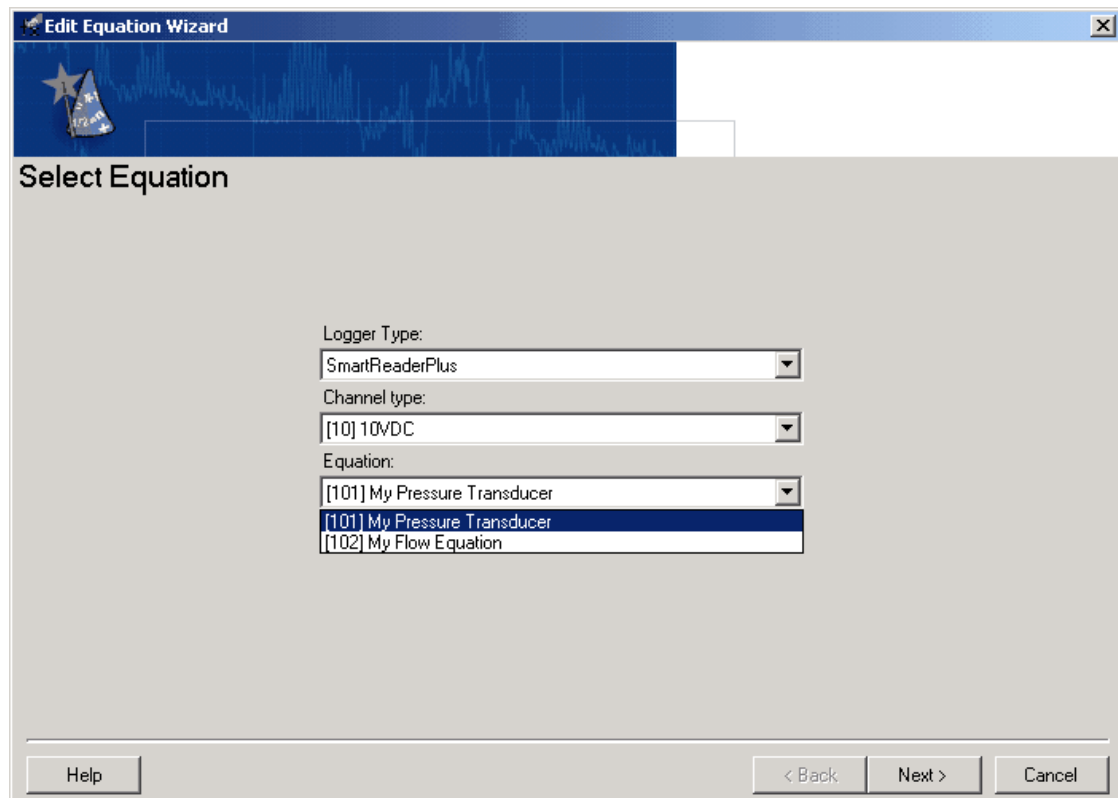
7.3 **Edit Equation Wizard**

By selecting the Edit Equation Wizard in the Equations Menu, you can edit existing custom equations. The wizard takes you through the steps required to edit the equation.

7.3.1 **Select Equation**

In the first step of the wizard, you select what the logger and channel type are for the equation you want to edit.

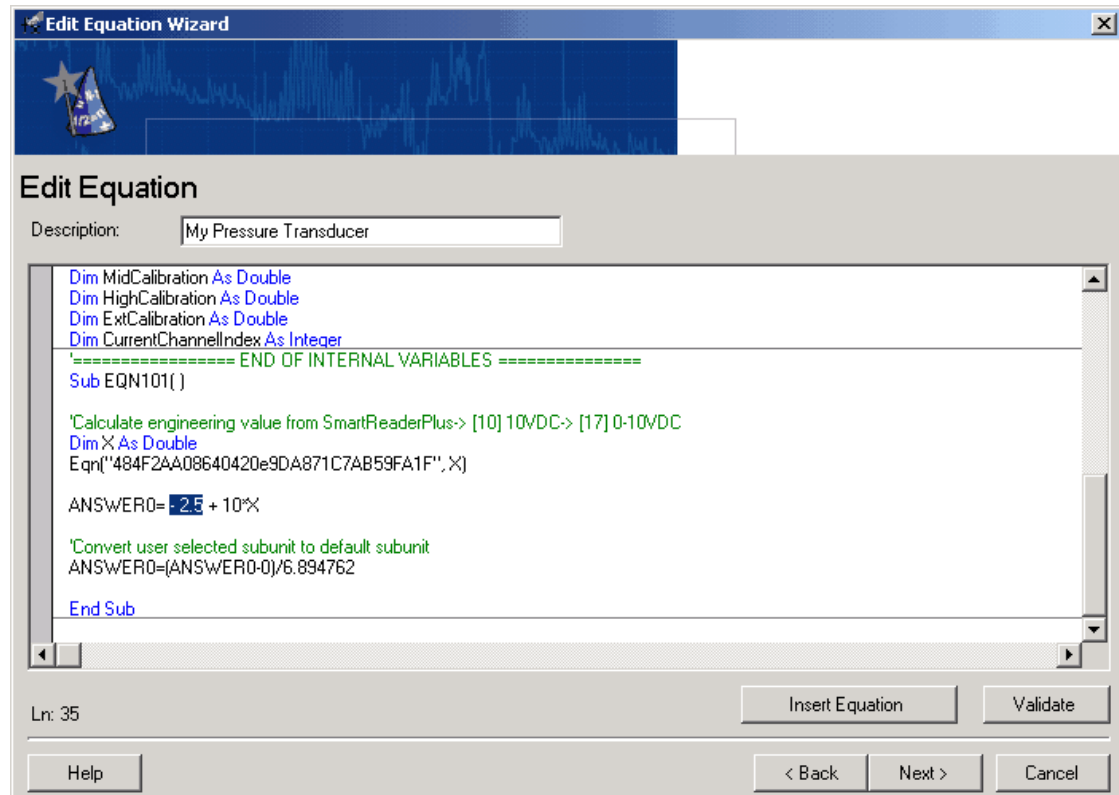
1. Click on the drop-down list to select the logger type.
2. Click on the drop-down list to select the channel type.
3. Click on the drop-down list to select the equation you want to edit.



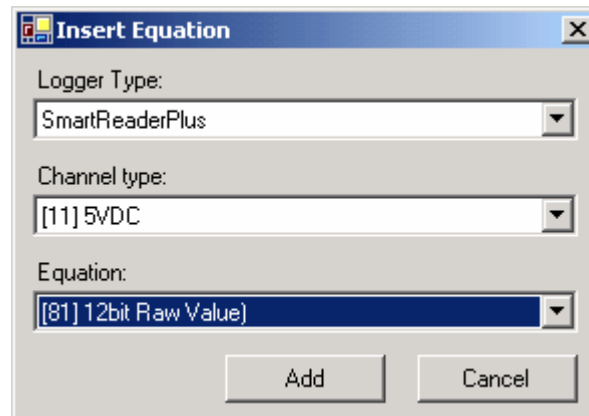
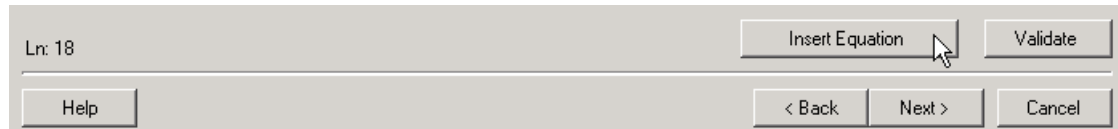
7.3.2 Edit Equation

In the second step of the wizard is where you can modify the contents of the equation.

1. Edit the code for the equation. For help on equation coding and examples, refer to [APPENDIX A Equation Language](#).



2. If you want to embed another equation into the current one, click on **Insert Equation**. This will pop up a dialog box allowing you to select the equation to add. For the inserted equation, select the logger type, channel type and then the equation from the drop-down lists. Click **Add** to insert the equation. Note that the equation will be inserted at the cursor.



3. Click **Validate** to verify that the equation you entered is structured correctly.

7.3.3 Change Output

The third step allows you to change what the output type is for the equation. Select the output logger type and channel type as necessary from the drop-down lists. You can also enter a different equation number. Once the selections are acceptable, click **Save** to save the revised equation to the system.

The screenshot shows the 'Edit Equation Wizard' dialog box, specifically the 'Change Output' step. The dialog has a title bar with a close button. Below the title bar is a decorative header with a star icon and a waveform. The main area is titled 'Change Output' and contains the following controls:

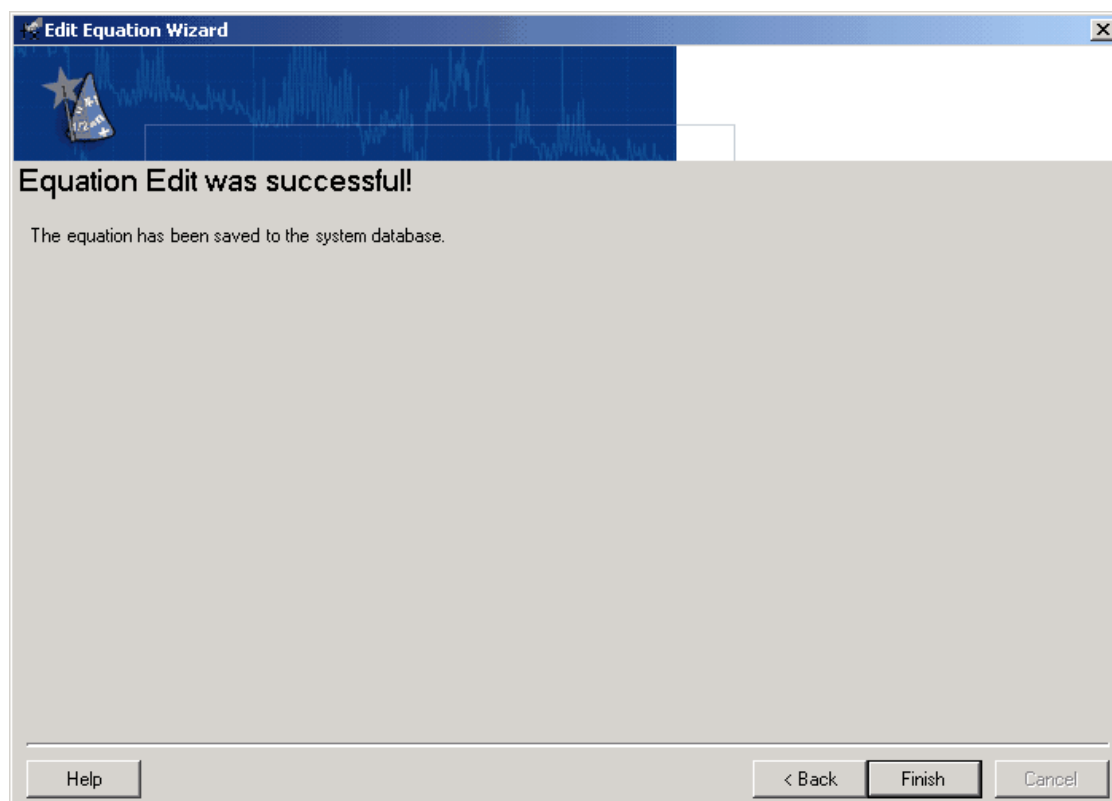
- Logger Type:** A drop-down menu currently showing 'SmartReaderPlus'.
- Channel type:** A drop-down menu currently showing '[10] 10VDC'.
- Equation:** A text box containing the number '102'.
- Reserved equation:** A list box containing the numbers '81', '17', and '142'.

At the bottom of the dialog, there are four buttons: 'Help', '< Back', 'Save', and 'Cancel'.

7.3.4

Completion

The final step confirms that the equation was saved to the system. Click **Finish** to complete the wizard. You can also click **Back** if you want to make more changes.

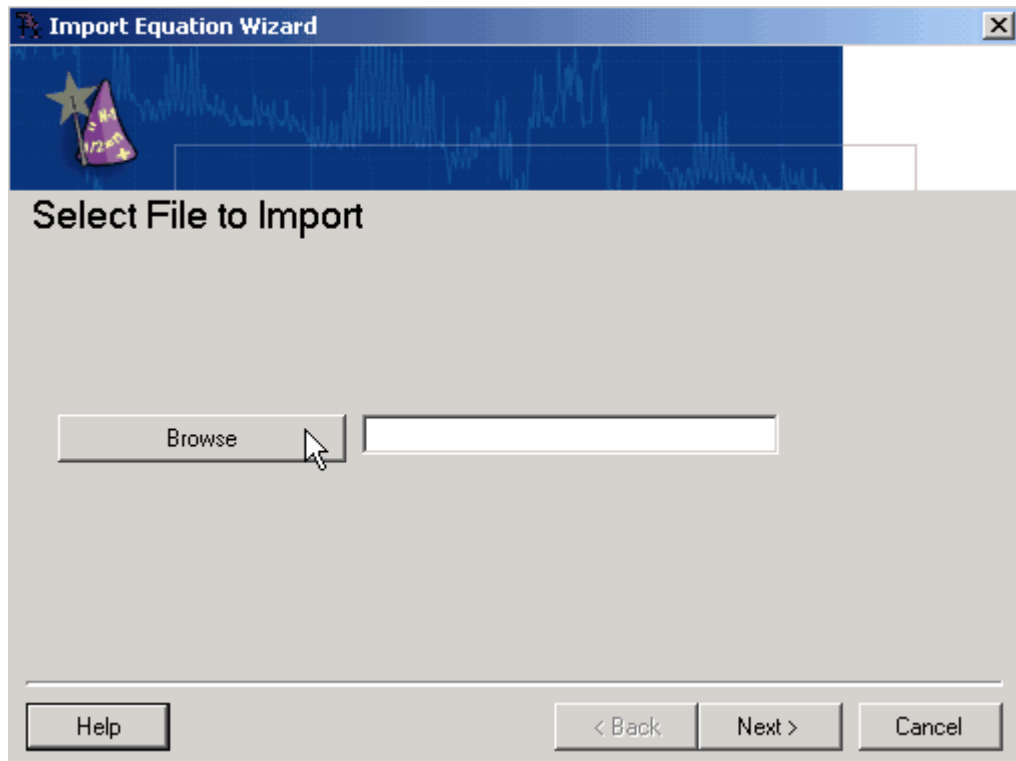


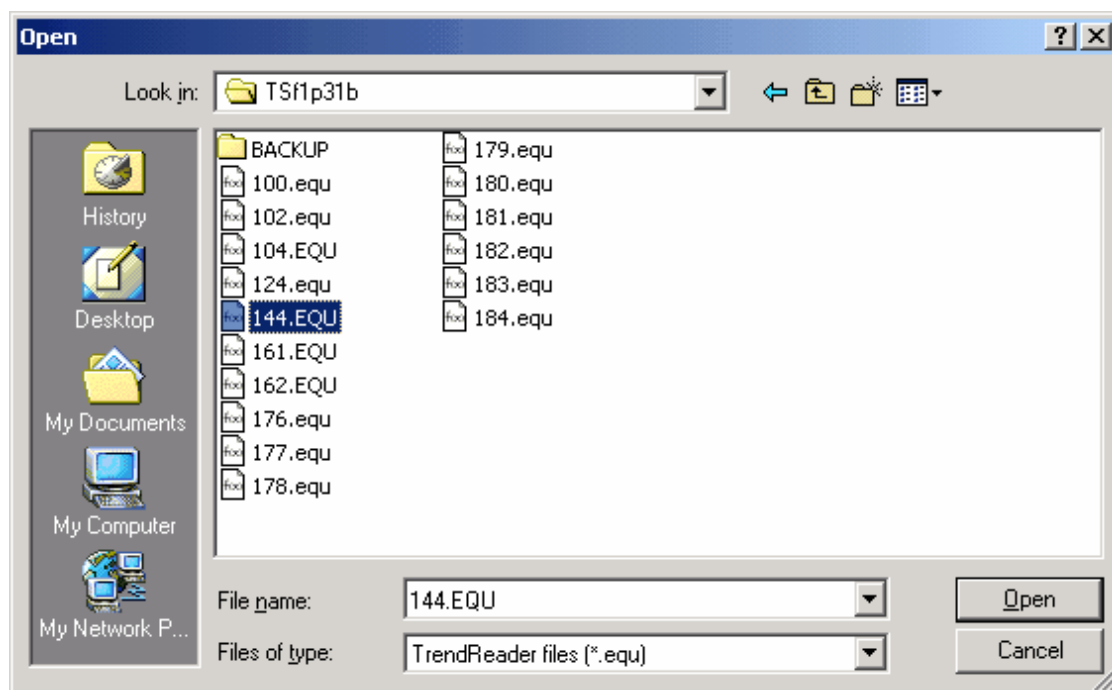
7.4 **Import Equation Wizard**

By selecting the Import Equation Wizard in the Equations Menu, you can import equations that were created on another computer or by an earlier version of the software. The wizard takes you through the steps required to bring the equation into your system.

7.4.1 **File Selection**

In the first step of the wizard, you select the equation file that you want to import. Click on the **Browse** button to bring up an Open file dialog box and select the file. The file may have an extension of either *.EQU or *.EQN. Earlier versions of TrendReader software create *.EQU equation files while *.EQN equations files are created by TrendReader Standard 2.



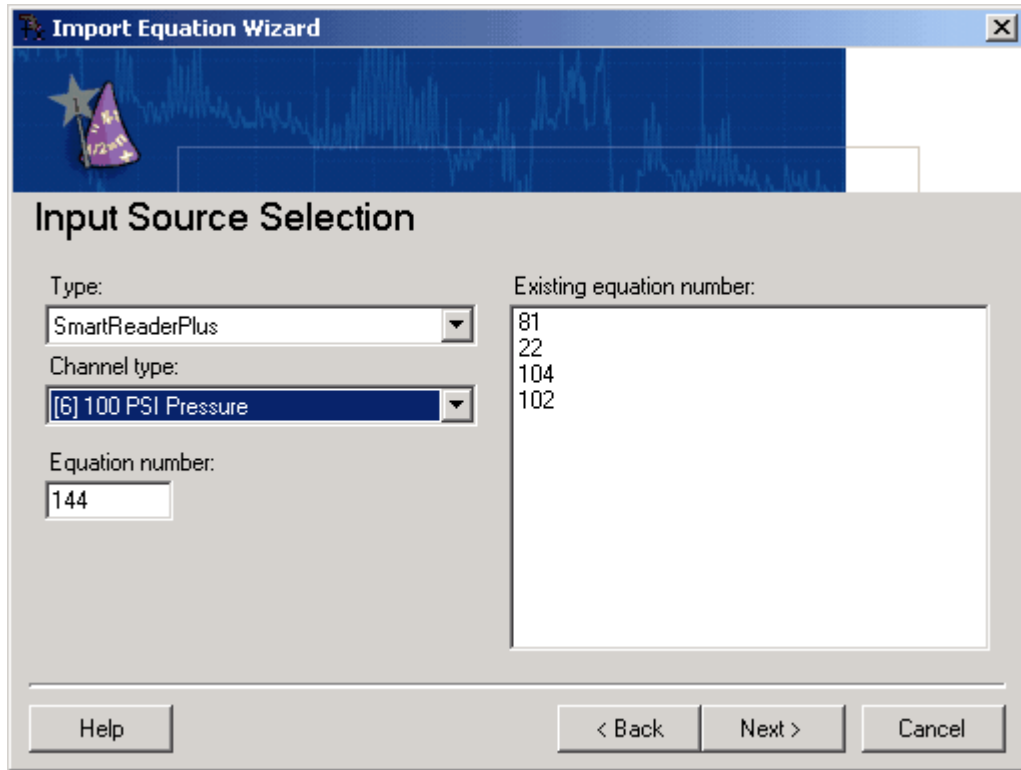


7.4.2 **Input Source**

In the second step of the wizard, you select what type and channel type the equation is specified for. Note that this step is omitted if you selected an *.EQN type equation.

1. Click on the drop-down list to select the equation type.
2. Click on the drop-down list to select the channel type. If you select to import a compound line, the channel type is disabled.
3. If the equation matches an equation currently in the system, a different number is required for the new equation. Highlight the equation number and enter a new one.

The display also shows other equations that are already in the system for the same channel and type.



7.4.3

Units

In the third step of the wizard, you select the units for the new equation. You can select a Unit Category that is already in the system or you can create a new one. Note that this step is omitted if you selected an *.EQN type equation.

Unit in the System

1. Click on the drop-down list to select the Unit Category. For example, for a pressure transducer equation, you would select Pressure.
2. Click on the drop-down list to select the Subunit. For example, for a pressure transducer equation, you could select kilopascal.

New Unit

1. Enter the Unit Category.
2. Enter the Subunit. This will be used as the main Subunit.
3. Enter the Symbol for the Subunit.

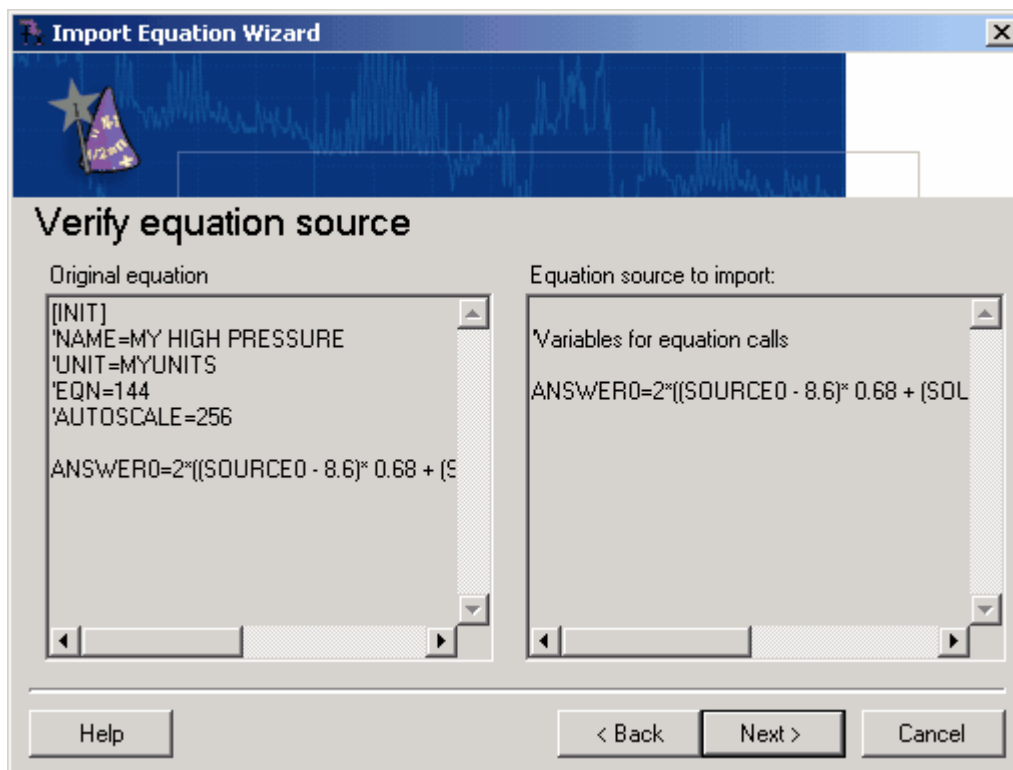
For each Subunit type, the Symbol, Scale, and Offset will also be shown. The Scale and Offset are used to convert from the main Subunit type, listed first, to another Subunit type.

The screenshot shows a software window titled "Import Equation Wizard" with a close button in the top right corner. The window has a decorative header with a blue background and a wizard hat icon. Below the header, the title "Select Unit" is displayed. There are two radio buttons: "Existing" (unselected) and "New" (selected). The "Existing" section contains labels for "Category:", "Subunit:", "Symbol:", "Scale:", and "Offset:", each followed by a text input field. The "New" section contains the same labels, but "Category:" and "Subunit:" are followed by dropdown menus, while "Symbol:", "Scale:", and "Offset:" are followed by text input fields. The "New" section fields contain the following values: "Category:" is "My Pressure", "Subunit:" is "Main Unit", "Symbol:" is "mu", "Scale:" is "1", and "Offset:" is "0". At the bottom of the window, there are three buttons: "Help", "< Back", and "Next >", and a "Cancel" button on the far right.

Field	Existing	New
Category	Dropdown	My Pressure
Subunit	Dropdown	Main Unit
Symbol	Text	mu
Scale	Text	1
Offset	Text	0

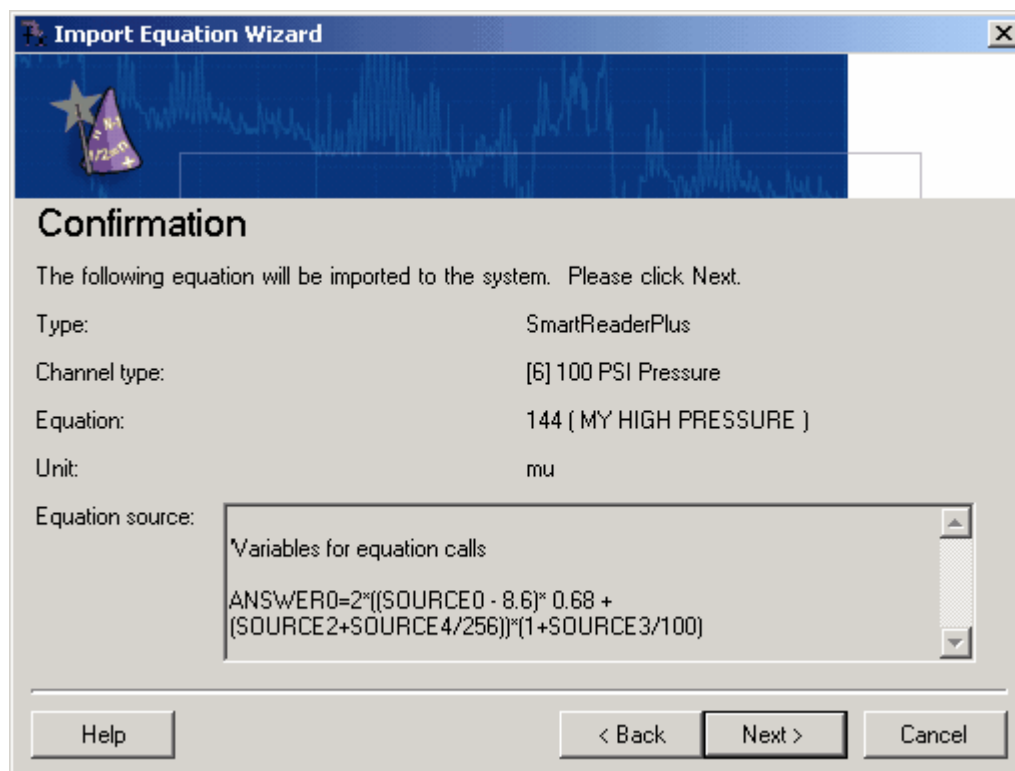
7.4.4 Verify Source

The fourth step allows you to verify that the equation you are importing is correct before importing the equation. Note that this step is omitted if you selected an *.EQN type equation.



7.4.5 Confirmation

The fifth step allows you to verify that the equation you are importing is correct before importing the equation. If the equation is acceptable, clicking **Next** will add the equation to the system.



The dialog box is titled "Import Equation Wizard" and features a blue header bar with a star icon. Below the header, the word "Confirmation" is displayed in a large, bold font. The main area contains the following text and fields:

The following equation will be imported to the system. Please click Next.

Type: SmartReaderPlus

Channel type: [6] 100 PSI Pressure

Equation: 144 (MY HIGH PRESSURE)

Unit: mu

Equation source:

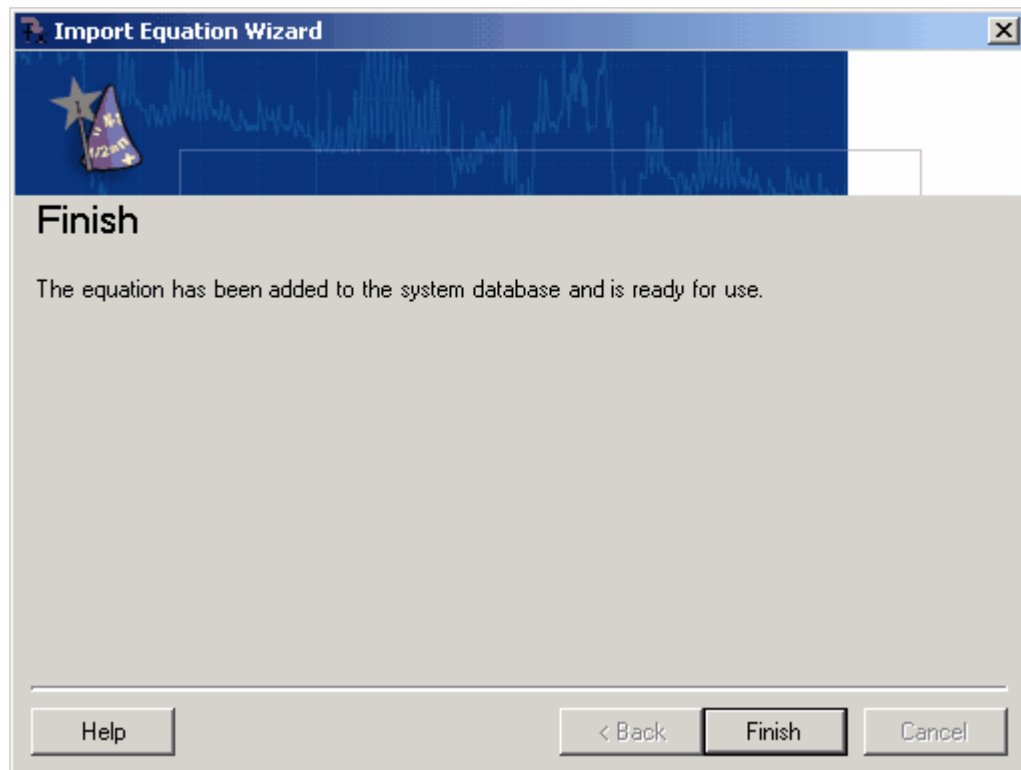
Variables for equation calls

$$\text{ANSWER0} = 2 * ((\text{SOURCE0} - 8.6) * 0.68 + (\text{SOURCE2} + \text{SOURCE4} / 256)) * (1 + \text{SOURCE3} / 100)$$

At the bottom of the dialog, there are four buttons: "Help", "< Back", "Next >", and "Cancel". The "Next >" button is highlighted with a black border.

7.4.6**Completion**

The final step provides a summary of the equation that was imported. Click **Finish** to complete the wizard.



7.5 Export Equation Wizard

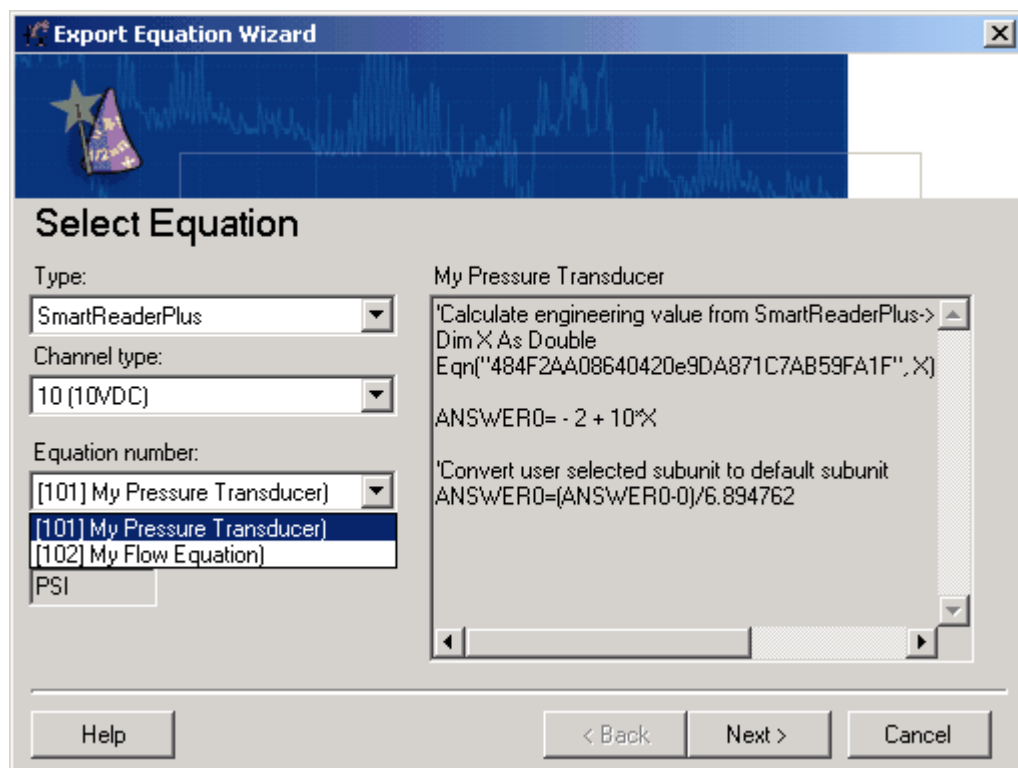
By selecting the Export Equation Wizard in the Equations Menu, you can export equations so they can be used on another computer. The wizard takes you through the steps required to bring the equation into your system.

7.5.1 Equation

In the first step of the wizard, you select what the type and channel type are for the equation you want to export.

1. Select the equation type from the drop-down list.
2. Select the channel type from the drop-down list. If you select to export a compound line, the channel type is disabled.
3. Select the equation number from the drop-down list.

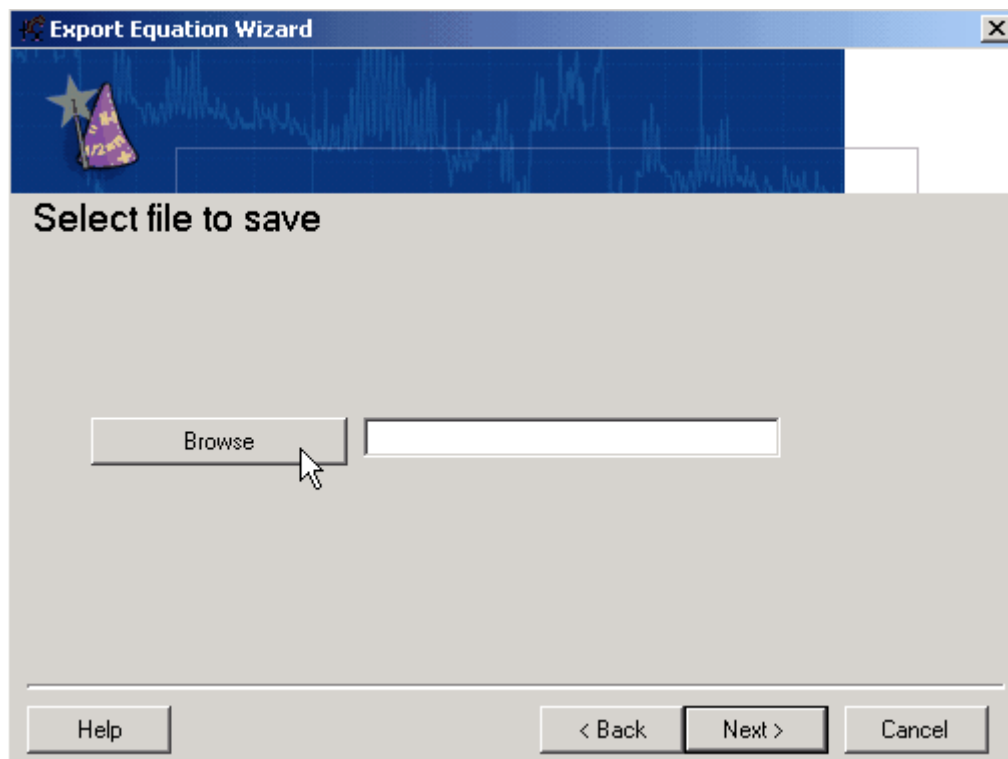
The display shows the equation and the units.

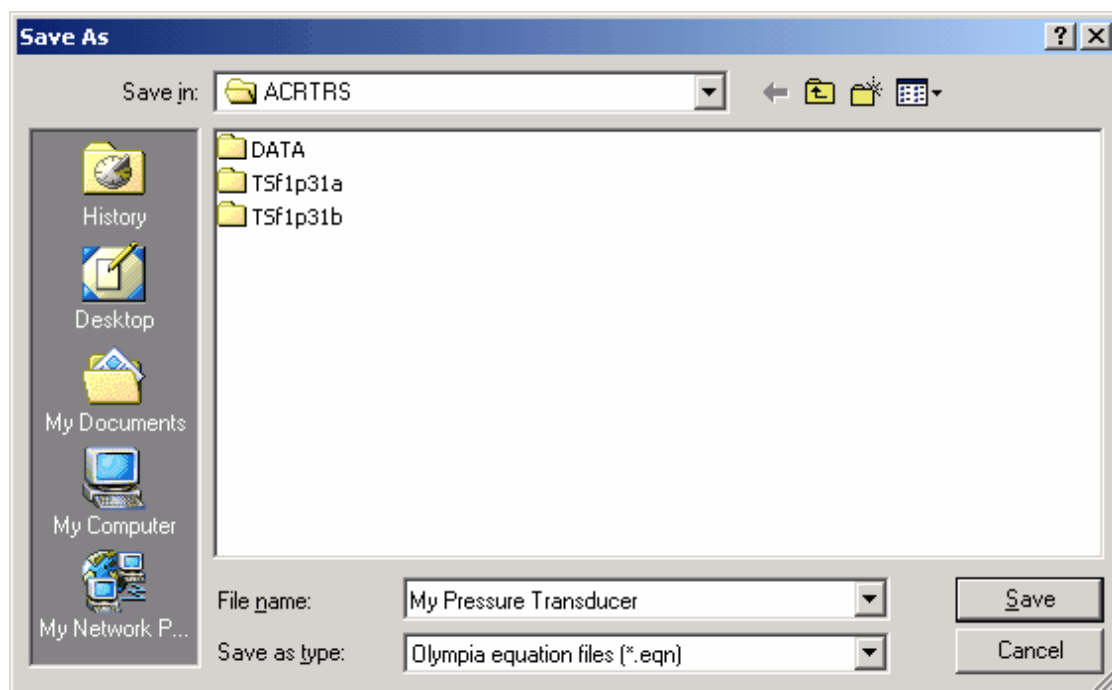


7.5.2

File Selection

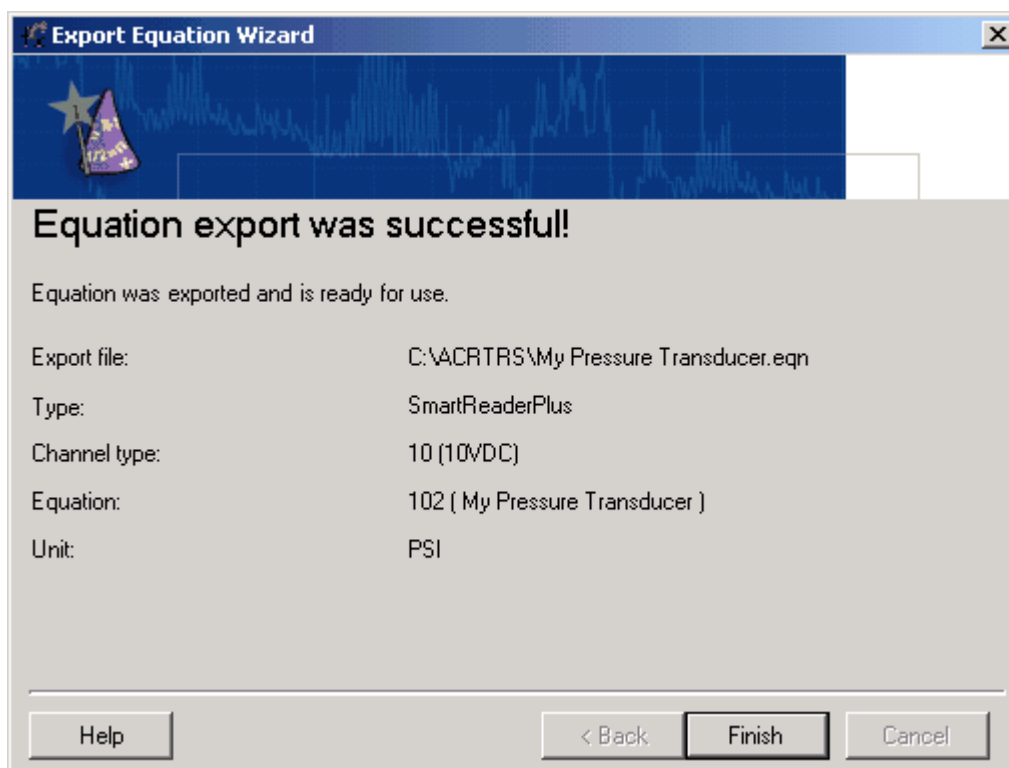
In the second step of the wizard, you select the equation file that you want to export. Click on the **Browse** button to bring up a Save As file dialog box and select the file or enter a new file name. The file will have an extension of *.EQN. Clicking Next will export the equation to the file.





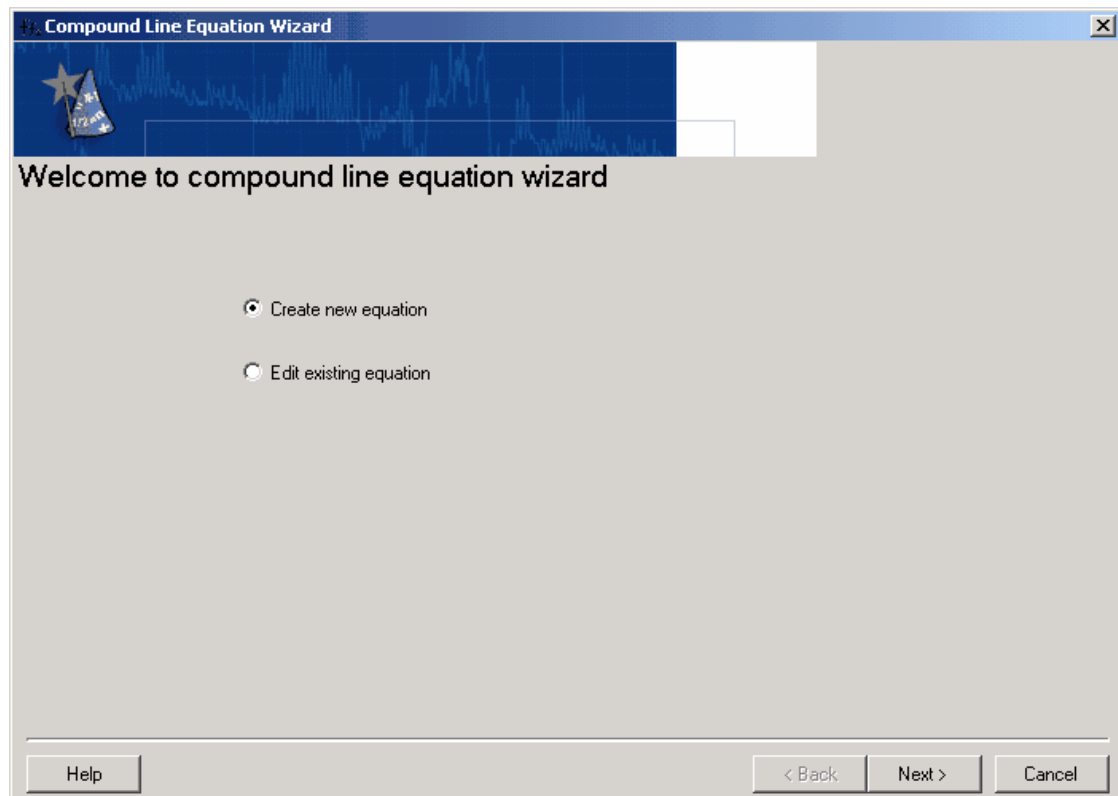
7.5.3**Completion**

The final step provides a summary of the equation that was exported. Click **Finish** to complete the wizard.



7.6 **Compound Line Equation Wizard**

A compound line is a graph line that is made from data from one or more other graph lines. An example would be calculating power by multiplying a measured current with a measured voltage. Before you use a compound line in a graph, you require a compound line equation. A compound line equation is similar to regular logger equations except that you can specify multiple sources of data to use in the calculation. From the wizard, you can choose to [Create](#) or [Edit](#) a compound line equation.



7.6.1 **Create Compound Line Equation**

By selecting the Create New Equation option in the Compound Line Equation Wizard, you can create compound line equations. The wizard takes you through the steps required to create the equation.

7.6.1.1 **Output Unit**

In the first step of the wizard, you select the units for the new equation. You can select a Unit Category that is already in the system or you can create a new one.

Unit in System

1. Select the Unit Category. For example, for a power equation, you would select Power.
2. Select the Subunit. For example, for a power equation, you could select kilowatts.

New Unit

1. Enter the Unit Category.
2. Enter the Subunit. This will be used as the main Subunit.
3. Enter the Symbol for the Subunit.

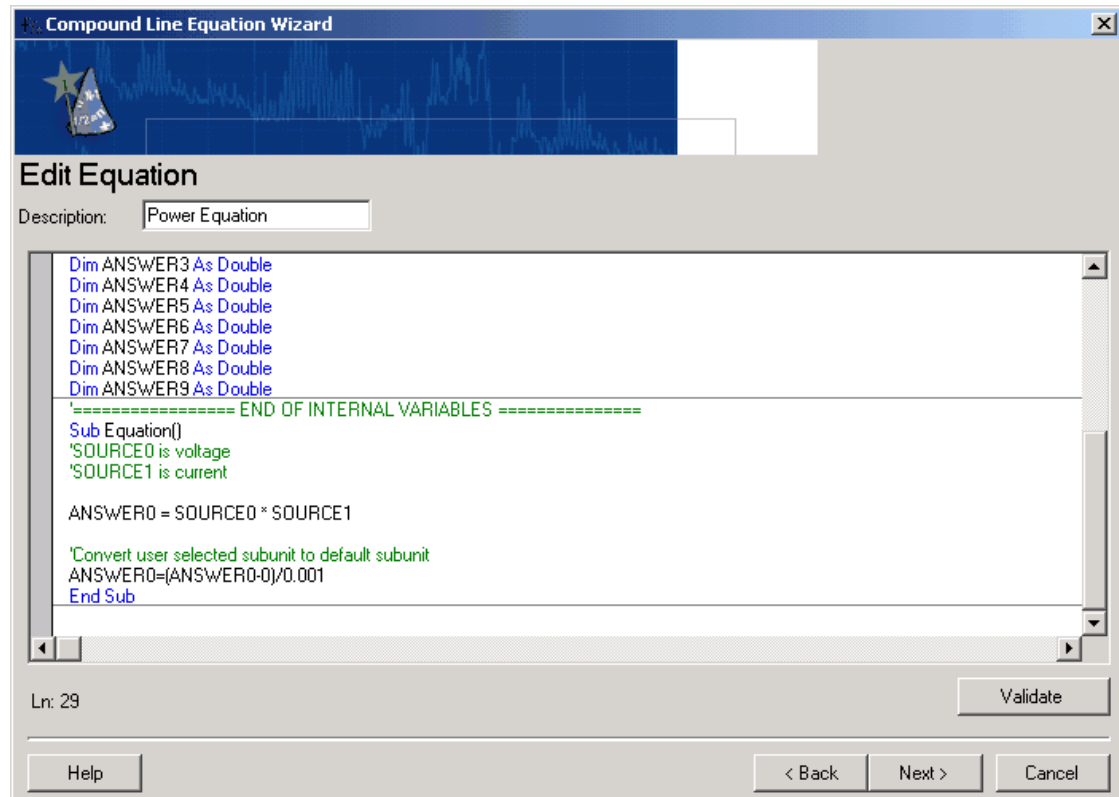
The screenshot shows the 'Compound Line Equation Wizard' dialog box. The title bar reads 'Compound Line Equation Wizard'. The main area is titled 'Select Output Unit'. There are two radio buttons: 'Existing' (selected) and 'New'. Under 'Existing', there are two dropdown menus. The first is labeled 'Category:' and has 'Power' selected. The second is labeled 'Subunit:' and has a list of units: 'watt', 'kilowatt' (highlighted), 'megawatt', 'British Thermal Units/hour', 'horsepower', 'calories/second', and 'pound-feet/minute'. Under 'New', there are three text input fields labeled 'Category:', 'Subunit:', and 'Symbol:', each with placeholder text 'New unit', 'New sub unit', and 'Symbol' respectively. At the bottom, there are four buttons: 'Help', '< Back', 'Next >', and 'Cancel'.

7.6.1.2 Enter Equation

The second step of the wizard allows you to enter your formula.

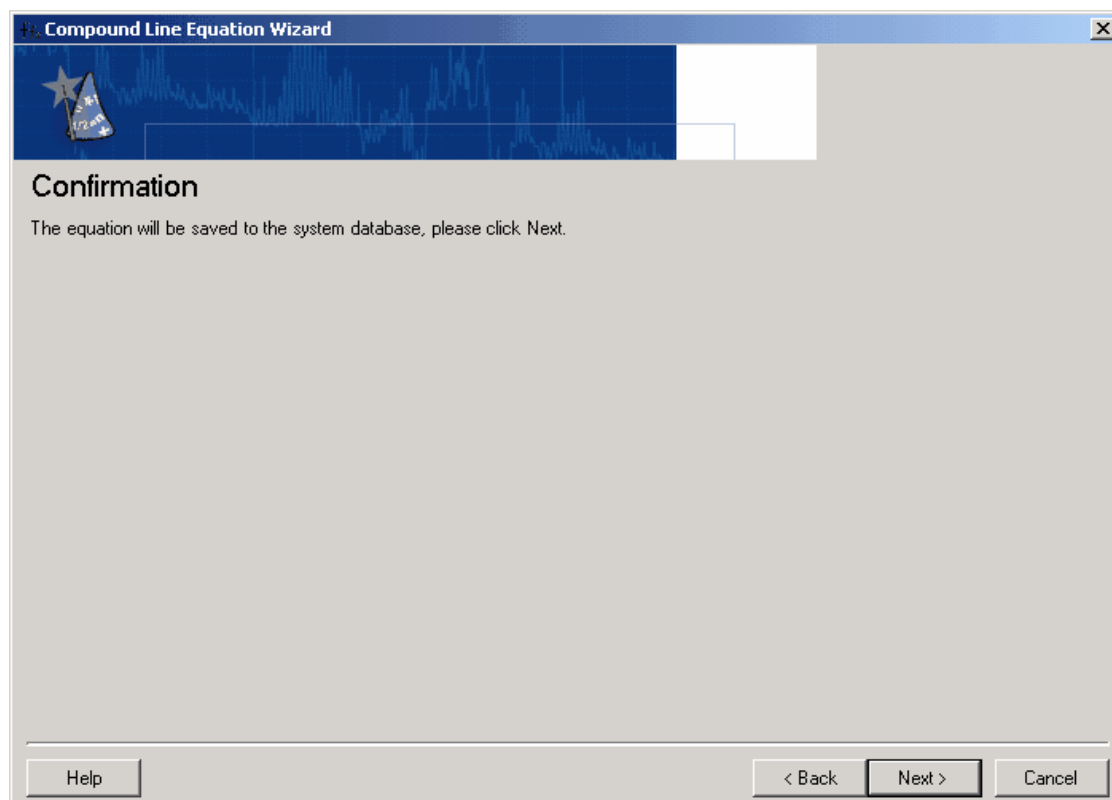
1. Enter the code for the equation. For help on equation coding and examples, refer to [APPENDIX B Compound Line Equations](#).
2. Enter a Description for the equation.

3. Click **Validate** to verify that the equation you entered is structured correctly.



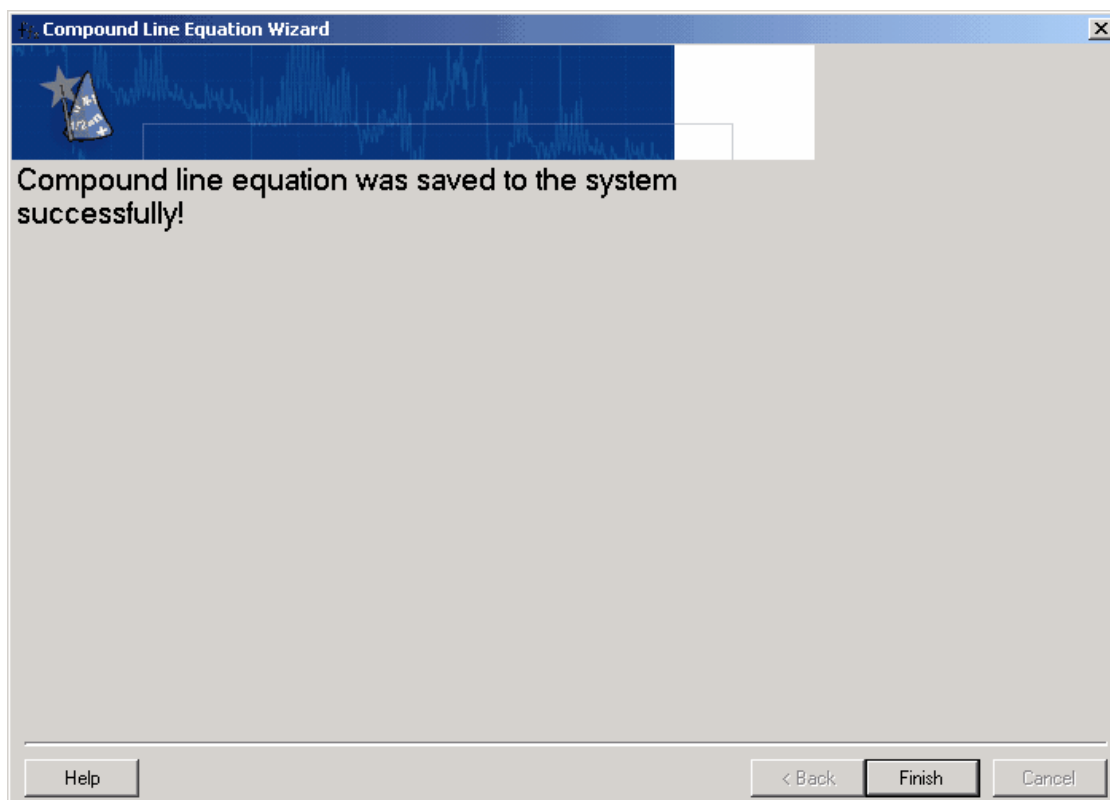
7.6.1.3 Confirmation

The third step allows you to verify that the equation you have entered is correct. If the equation is acceptable, clicking **Next** will add the equation to the system.



7.6.1.4 Completion

The final step confirms that the equation was added to the system. Click **Finish** to complete the wizard.

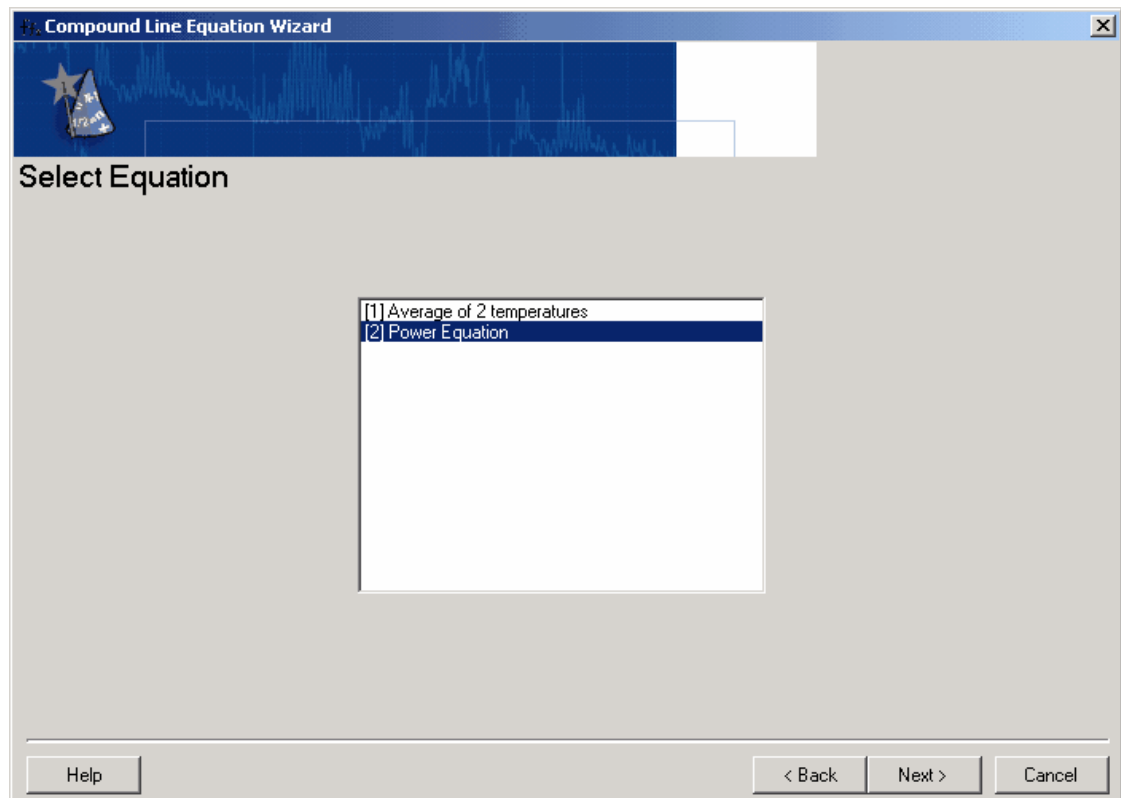


7.6.2 Edit Compound Line Equation

By selecting the Edit Equation option in the Compound Line Equation Wizard, you can edit existing compound line equations. The wizard takes you through the steps required to edit the equation.

7.6.2.1 Select Equation

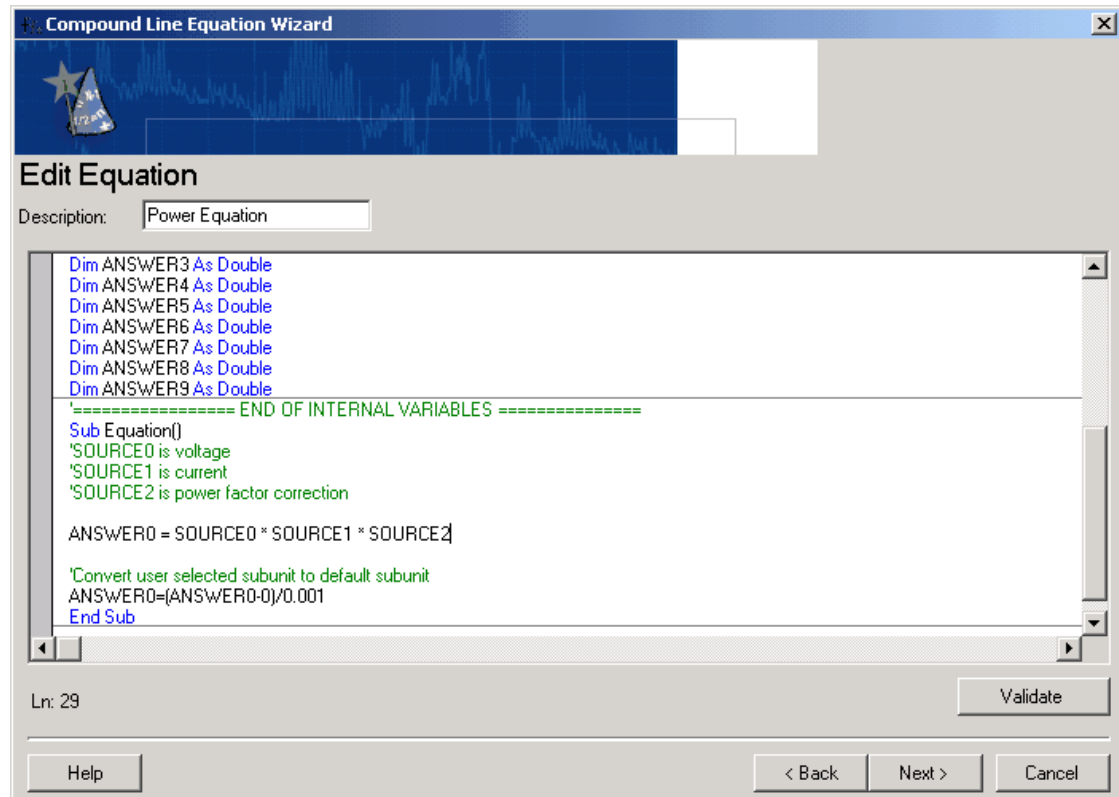
In the first step of the wizard, you select the compound line equation that you want to edit.

**7.6.2.2 Edit Equation**

In the second step of the wizard, you edit or modify the equation description or formula.

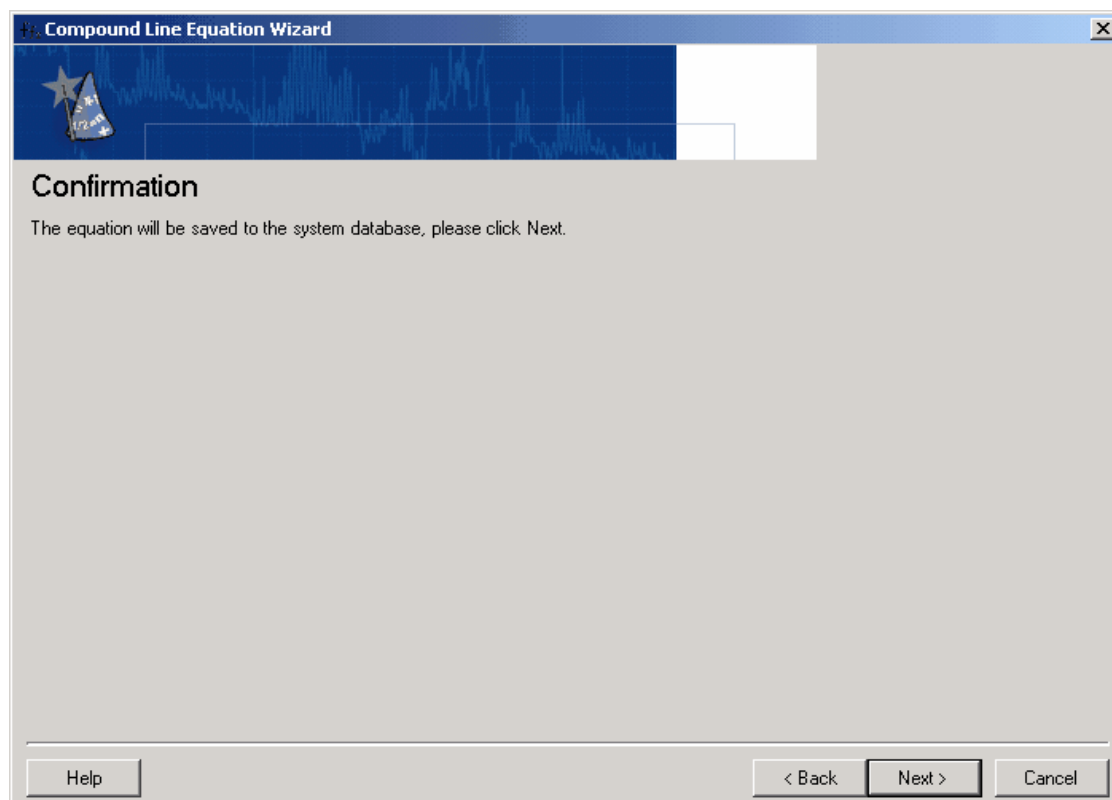
1. Enter the code for the equation. For help on equation coding and examples, refer to [APPENDIX B Compound Line Equations](#).
2. Enter a Description for the equation.

3. Click **Validate** to verify that the equation you entered is structured correctly.



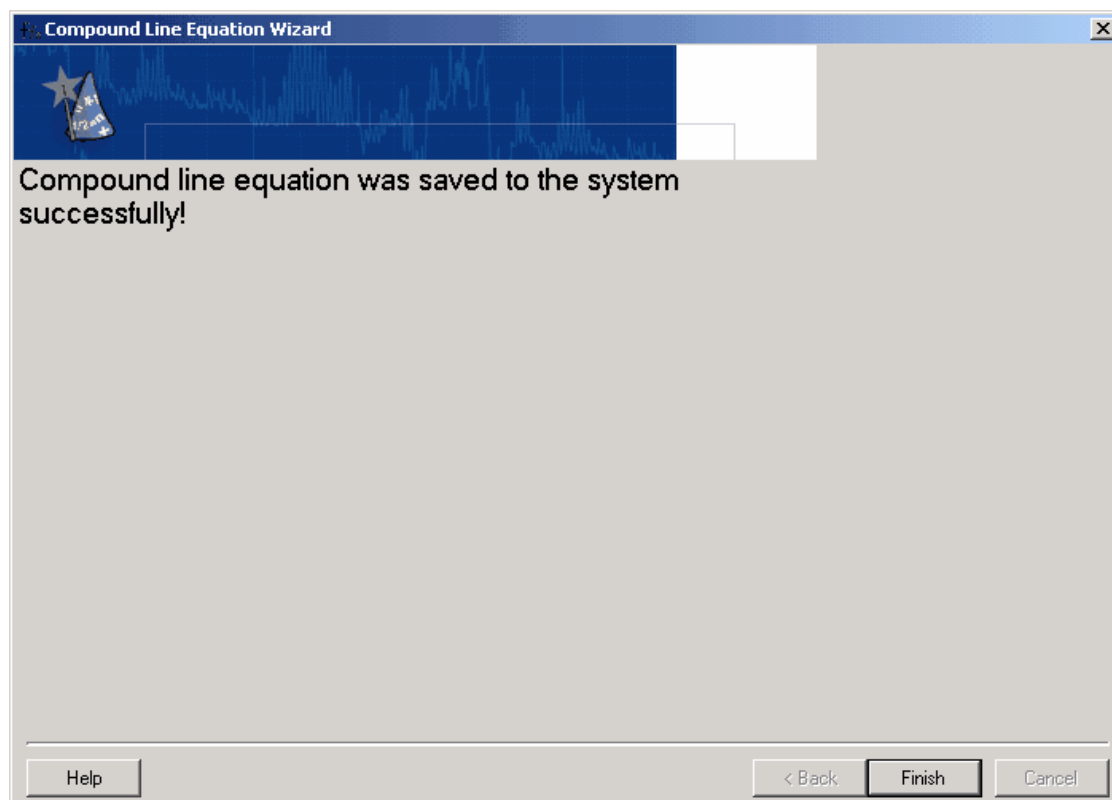
7.6.2.3 Confirmation

The third step allows you to verify that the equation you have entered is correct. If the equation is acceptable, clicking **Next** will save the equation to the system.



7.6.2.4 Completion

The final step confirms that the equation was saved to the system. Click **Finish** to complete the wizard.



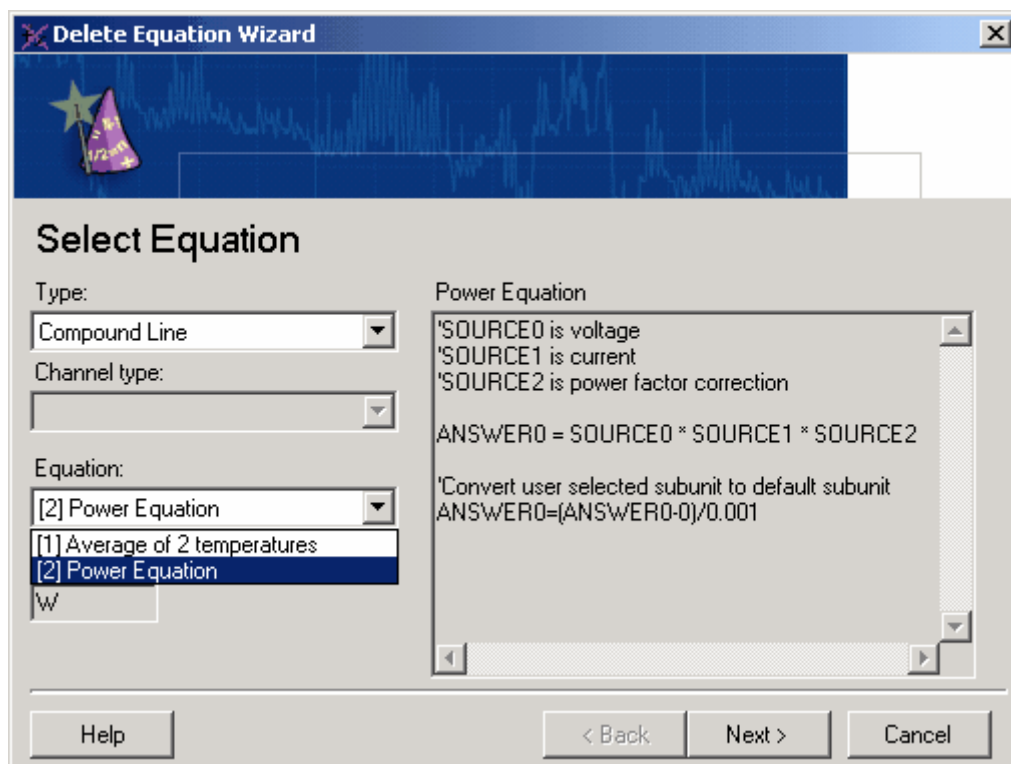
7.7 Delete Equation Wizard

By selecting the Delete Equation Wizard in the Equations Menu, you can delete equations that you no longer need. The wizard takes you through the steps required to remove the equation from your system.

7.7.1 Select Equation

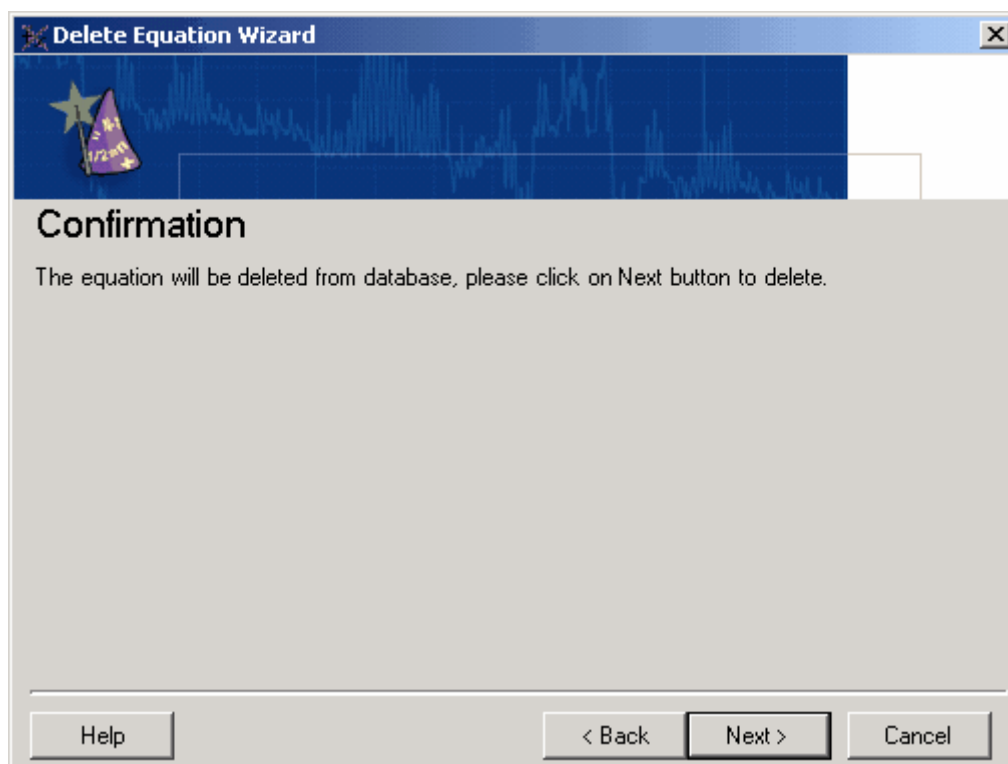
In the first step of the wizard, you select what type of equation you want to delete. Then you select the channel type (if applicable) and the equation.

1. Click on the drop-down list to select the equation type.
2. Click on the drop-down list to select the channel type. If you select to export a compound line, the channel type is disabled.
3. Click on the drop-down list to select the equation you want to delete.



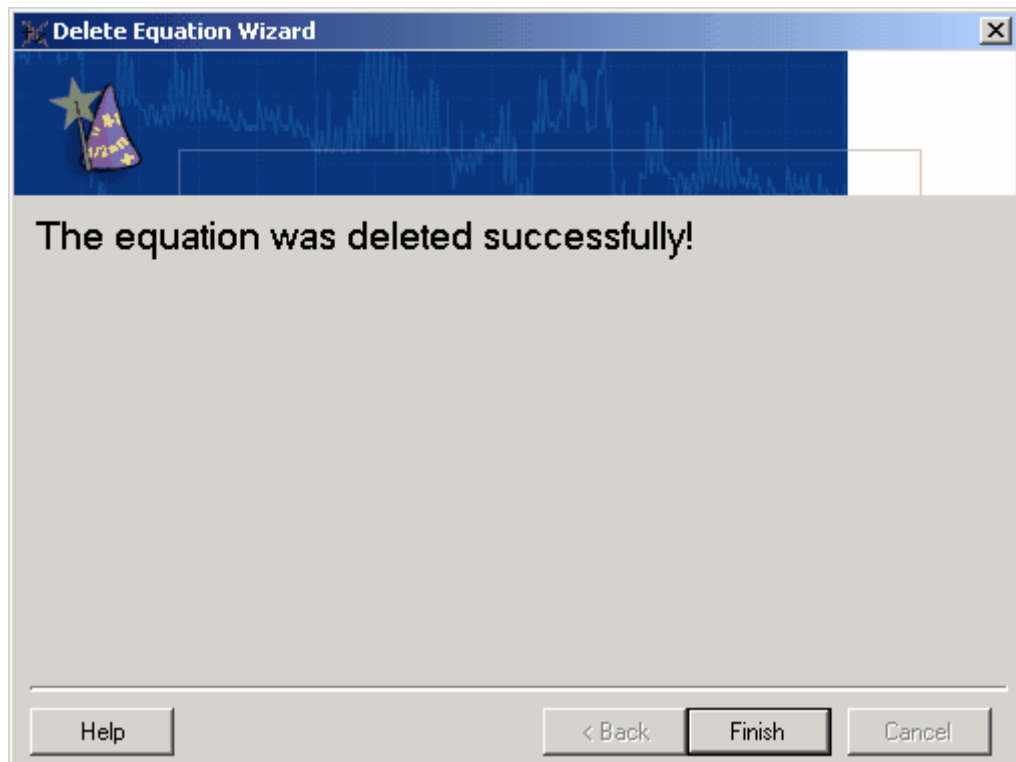
7.7.2 **Confirmation**

The second step allows you to verify that the equation you are deleting is the correct one. Clicking **Next** will remove the equation from the system. Note that this cannot be undone.



7.7.3**Completion**

The final step confirms that the equation was deleted from the system. Click **Finish** to complete the wizard.



7.8 **APPENDIX A Equation Language**

Equation Language

7.8.1 **Equation Language Introduction**

Equations in TrendReader Standard 2 use the VB.Net language. Therefore, any code in an equation must be compliant with the syntax of VB.Net. Although the equation script is VB.Net compliant, you cannot use all VB.Net methods and functions because some method related references may not be added to the equation project. Currently, all equation projects have **Microsoft.VisualBasic** and **System** references imported, so any functionality and definitions under these two references can be implemented. For detailed information please refer to VB.Net documentation.

An equation is a block of code, formatted in the VB.Net language, that is saved in the system database with a unique ID. Prior to the execution of the equation, it is compiled into a dynamic link library (dll) and instantiated as an executable object.

A standard equation looks like:

```
Sub EQN101( )

    'Calculate engineering value from [1] 8bit Logger-> [0] Any Channel-> [38] 8bit
    'Raw Value
    Dim X As Double
    Eqn ("CF717AC31D0B479c94AD902D349BDF20", X)

    ANSWER0= 2 + 2*X

    'Convert user selected subunit to default subunit
    ANSWER0=(ANSWER0-0)/1000

End Sub
```

1. **Sub EQN101()** and **End**
These lines denote the start and end of the equation code.
2. **Dim X As Double**
This line declares a variable X to be used in the code.
3. **Eqn ("CF717AC31D0B479c94AD902D349BDF20", X)**
This line calculates the engineering value of the current reading from the logger using another equation and assigns it to the variable X. The equation is identified using a unique ID -- "CF717AC31D0B479c94AD902D349BDF20". This type of statement is used when you need to use the engineering value for the reading in your equation. For example, if you had a transducer that output a voltage proportional to pressure, you would typically use the voltage channel. To calculate the pressure, you would first need to convert the data logger reading into a voltage using such a statement. To call another equation in your code, click the **"Insert Equation"** button and select the equation from the pop up window.
4. **ANSWER0 = 2 + 2*X**
The result of your equation must be assigned to ANSWER0 in the line just before **'== end**

of user defined code ==.

5. $ANSWER0 = (ANSWER0-0)/1000$
This line is inserted by the system and is used to convert the result from your selected subunit into the default subunit. If you are using the default subunit, this line will not appear.

7.8.2 Objects

An object is a software entity which can be used in equations. An object includes properties and methods which can be invoked by equations. You have access to two objects: [Logger](#) and [Channel](#).

7.8.2.1 Logger

The Logger object is a software representation of the physical logger. The properties associated with a Logger are:

Table 1: Logger Properties

Name	Type	Description
LoggerName	String	name of the logger
LoggerType	Integer	type of the logger
Channel(i As Integer)	Object	channel object
SampleRate	Double	sampling rate of logging
NumberOfChannels	Integer	number of channels logger contains
RangeSize	Double	range size of logger, OWL logger specific property
RangeResistor	Double	range resistor, OWL logger specific property
RangeGain	Double	range gain, OWL logger specific property
RangeOffset	Double	range offset, OWL logger specific property

The methods associated with a Logger are:

GetChannelIndexByNumber(ch_number As Integer) As Integer

This method gets the channel index of a given channel number. A channel index is the sequential number of Logger object. A channel number is the number retrieved from the physical logger.

GetChannelNumberByIndex(index As Integer) As Integer

This method gets the channel number of a given channel index.

GetChannelReading(index As Integer) As Double

This method gets the engineering value of the reading for the channel referenced by index.

7.8.2.2 Channel

The Channel object is a software representation of the physical channel of logger. You can get a given channel's Channel object by calling Logger's property using `Logger.Channel( X )`. The properties associated with a Channel are:

Table 2: Channel Properties

Name	Type	Description
ChannelNumber	Integer	the channel number of the physical channel of the logger
ChannelDescription	String	description of the channel
ChannelType	Integer	type of logger
Equation	Integer	equation number of the channel
AlarmLowEnabled	Boolean	low alarm enabled
AlarmHighEnabled	Boolean	high alarm enabled
AlarmLow	Double	low alarm threshold
AlarmHigh	Double	high alarm threshold
LowCalibration	Double	low calibration value
MidCalibration	Double	middle calibration value
HighCalibration	Double	high calibration value
ExtCalibration	Double	extension calibration
FactZero	Double	factory defined zero value
FactSpan	Double	factory defined span value
Reading	Double	engineering reading that is updated each time when the equation is executed for current channel
RawReading	Double	binary value of reading
ChannelEnabled	Boolean	channel is enabled

The methods associated with a Channel are:

GetCompensationChannel() As Integer

This method gets the current channel's compensation channel index.

SetCompensationChannel(val As Integer)

This method sets the current channel's compensation channel index.

SetEngReading(val As Double)

This method sets the engineering value of the current channel.

7.8.3 Public Variables

The following is a list of Public Variables that can be read from/written to:

Table 3: Public Variables

Name	Type	Description
SOURCE0	Double	current channel's raw value
SOURCE1	Double	sample rate in seconds
SOURCE2	Double	current channel's low calibration value
SOURCE3	Double	current channel's mid calibration value
SOURCE4	Double	for OWL loggers: factory defined zero value for other loggers: current channel's high calibration value
SOURCE5	Double	for OWL loggers: factory defined span value for other loggers: current channel's extension calibration value.
SOURCE6	Double	for OWL loggers: range size for other loggers: compensation value used for engineering adjustment.
SOURCE7	Double	for OWL loggers: range resistor value for other loggers: N/A
SOURCE8	Double	for OWL loggers: range gain value for other loggers: N/A
SOURCE9	Double	for OWL loggers: range offset for other loggers: sample rate in minutes
ANSWER0	Double	persistent parameter that contains the result of the equation, i.e. you should put ANSWER0={ result } as the last line of the equation
ANSWER1, ..., ANSWER9	Double	ANSWER1 to ANSWER9 are channel level values persistent during the life cycle of the logger
LowCalibration	Double	low calibration value, equivalent to <code>Logger.Channel(CurrentChannelIndex).LowCalibration</code>
MidCalibration	Double	middle calibration value, equivalent to <code>Logger.Channel(CurrentChannelIndex).MidCalibration</code>
HighCalibration	Double	high calibration value. equivalent to <code>Logger.Channel(CurrentChannelIndex).HighCalibration</code>
ExtCalibration	Double	extension calibration value, equivalent to <code>Logger.Channel(CurrentChannelIndex).ExtCalibration</code>
CurrentChannelIndex	Integer	current channel index the equation is working with

7.8.4 Reserved Variables

Reserved variables are variables that are declared internally and should not be redeclared in equations. The following is a list of reserved variables:

- All reserved variables defined in VB.Net

- All public variables mentioned in Public Variables chapter
- LocalIndex
- CompensationIndex
- Logger
- Equation

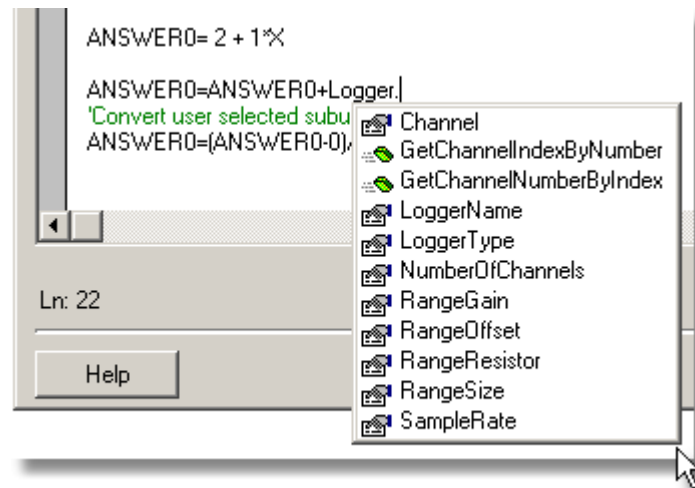
NOTE: All variables are not case sensitive.

7.8.5 Examples

The following sections give examples on using features of the language to create equations.

7.8.5.1 Using Intellisense

Intellisense is a helpful feature assisting you with selecting available operations that the current context supports. For example typing the word **Logger**. will automatically pop up a list of applicable properties and methods:



Intellisense is limited to the equation-related level only. For example, you cannot get system level intellisense if you type word **System**. However, you can still invoke the available operations by explicitly typing the name of the function. Similarly, the intellisense for **Math** only supports the most popular functions, but you can type the name of any function.

7.8.5.2 Using Math Functions

In order to use math functions in VB.Net, you need to use the **Math** entity to call any mathematical functions. The equation editor only supports the most popular functions with its intellisense feature, but you can use all functions that **Math** supports by typing the name of the function.

For example, if you want to use square root function, you may call:

```
X=Math.Sqrt(9)
```

Example:

This example demonstrates how to use a mathematical function in an equation.

```
Sub EQN101( )
```

```
"Calculate engineering value from [2] 12bit Logger-> [11] 5VDC-> [18] 0-5VDC
Dim X As Double
Eqn("5FD6BC0D64D34f73AFC40144A13A7998", X)
```

```
ANSWER0= - 12.5 + 25*X
```

```
' Apply square root of logger's sample rate
ANSWER0=ANSWER0+ Math.Sqrt(Logger.SampleRate)
```

```
End Sub
```

7.8.5.3 Object Properties

To get the logger level properties, enter:

```
X=Logger.{ Property name }
```

To get the current channel level properties, enter:

```
X=Logger.Channel ( CurrentChannelIndex ). { Property name }
```

You can either type in the Property name, or select it from the list that appears because of the intellisense feature of the editor.

Example:

This example demonstrates how to include calibration properties in an equation.

```
Sub EQN101( )
```

```
"Calculate engineering value from [2] 12bit Logger-> [11] 5VDC-> [18] 0-5VDC
Dim X As Double
Eqn("5FD6BC0D64D34f73AFC40144A13A7998",X)
```

```
ANSWER0= - 12.5 + 25*X
```

```
' Apply low calibration value of current channel
ANSWER0=ANSWER0+ (
    Logger.Channel(CurrentChannelIndex).LowCalibration ) / 100
```

```
End Sub
```

7.8.5.4 Linear Equation

The following is an example of the equation for an SRP7 logger using a relative humidity sensor.

Input sensor:	relative humidity sensor with output of 0.5-4.5V representing 0-100% humidity
Logger:	SRP7 0-5V channel
Equation output:	0-100%

The easiest way to create a linear equation for the relative humidity sensor is through the New Equation Wizard. The resulting equation will be:

```
Sub EQN101( )
```

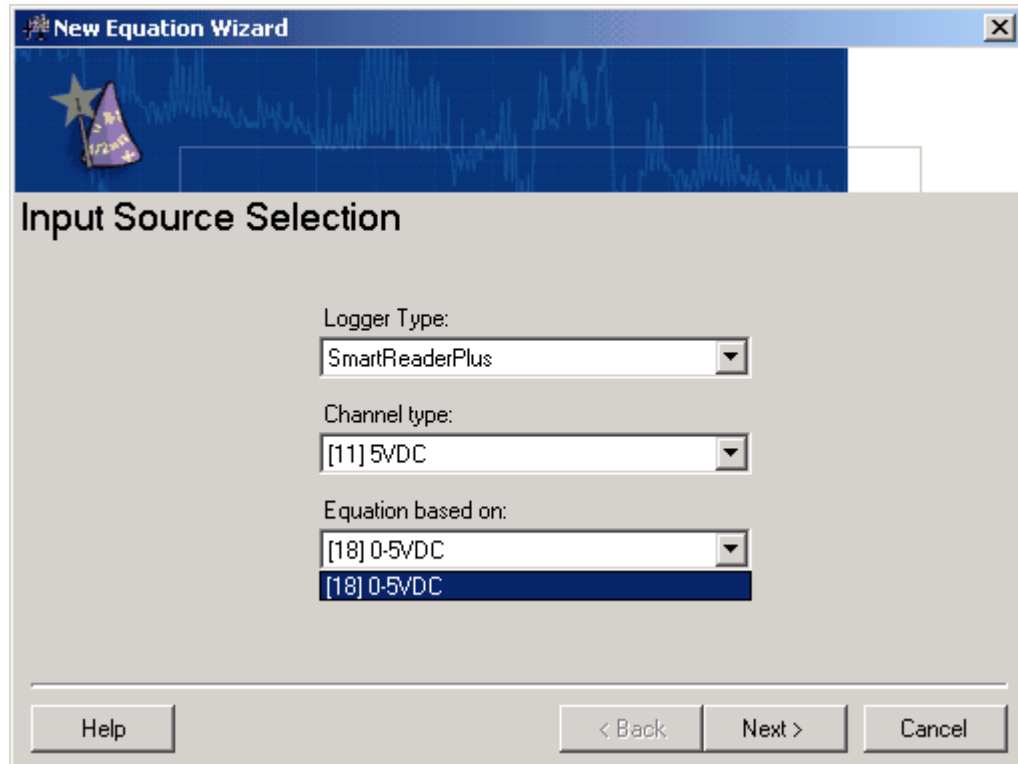
```
"Calculate engineering value from SmartReaderPlus-> [11] 5VDC-> [18] 0-5VDC
Dim X As Double
```

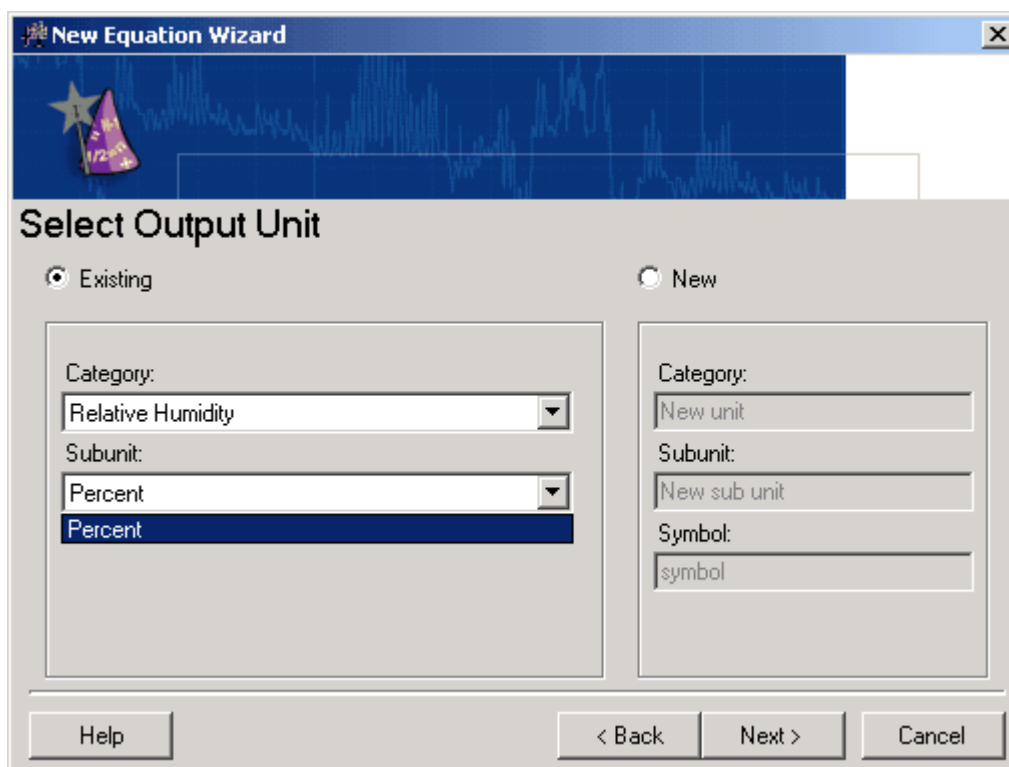
Eqn("5FD6BC0D64D34f73AFC40144A13A7998", X)

ANSWER0= - 12.5 + 25*X

End Sub

The following is the data you would enter in the New Equation Wizard to create the equation.





New Equation Wizard

Select Output Unit

☒ Existing ☐ New

Category: Relative Humidity

Subunit: Percent

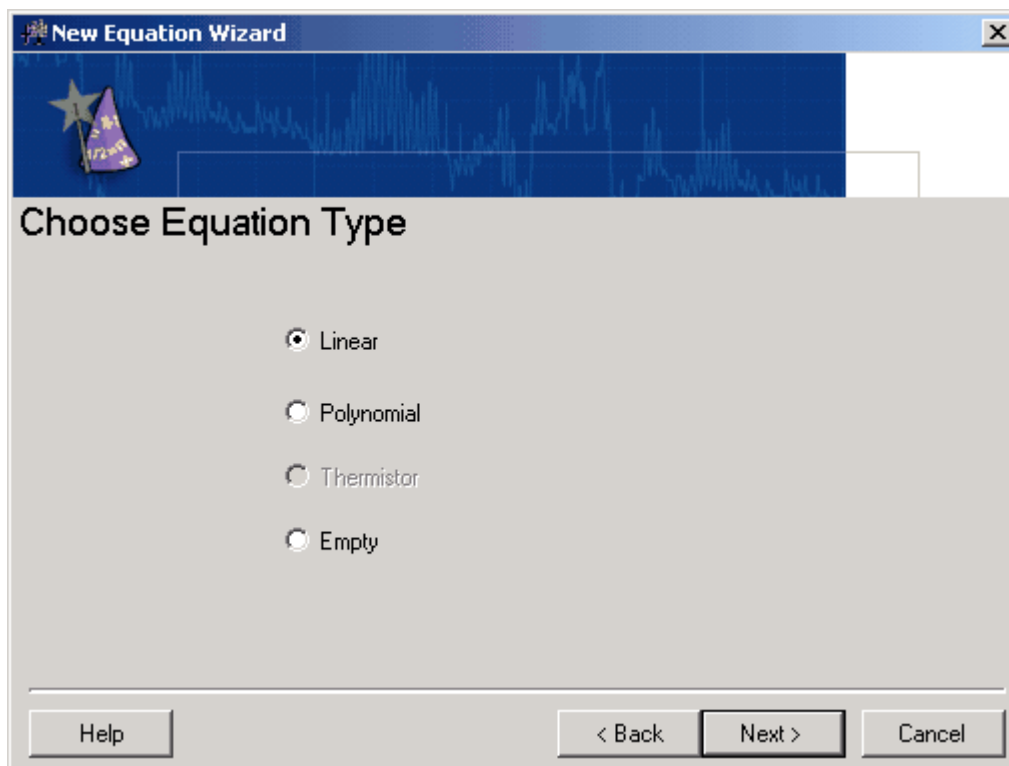
Percent

Category: New unit

Subunit: New sub unit

Symbol: symbol

Help < Back Next > Cancel



New Equation Wizard

Choose Equation Type

☒ Linear

☐ Polynomial

☐ Thermistor

☐ Empty

Help < Back Next > Cancel

New Equation Wizard



Input Parameters

Order: ☒ Channel engineering value
☐ Raw value

1

	Input (V DC)	Output (%)
#1	0.5	0
#2	4.5	100

Result:
 $Y = -12.5 + 25\%X$

Add row Delete row Generate

Help < Back Next > Cancel

New Equation Wizard



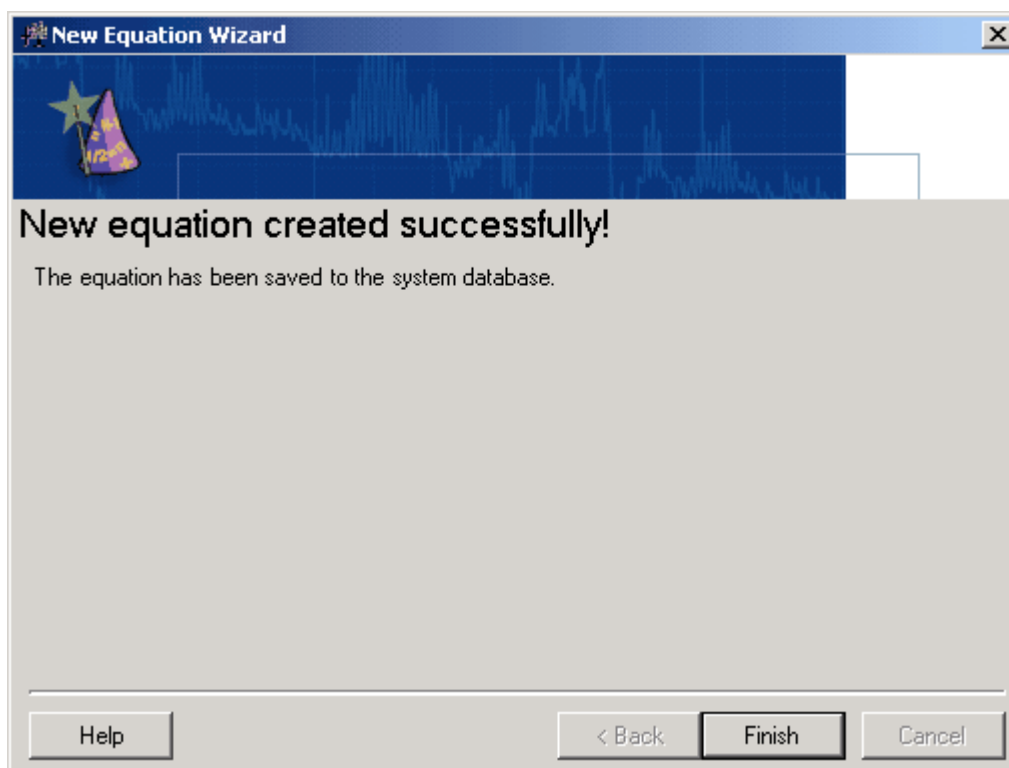
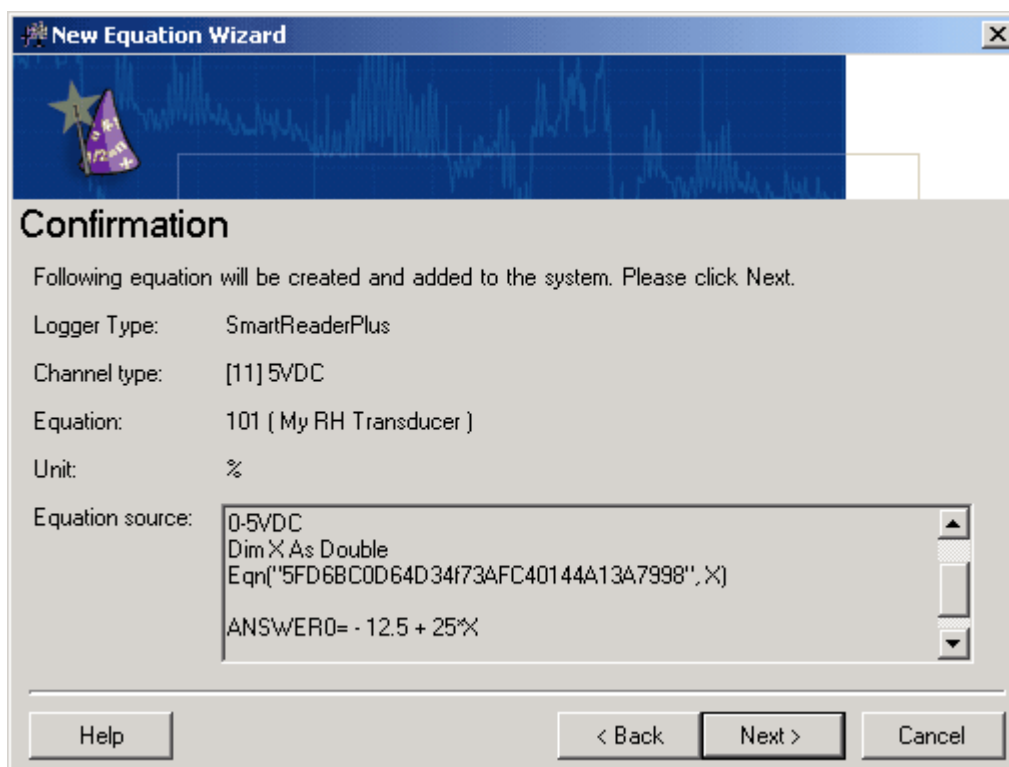
Select Output Equation

Equation number:
101

Description:
My RH Transducer

Reserved equation number:
18

Help < Back Next > Cancel



7.8.5.5 Persistent Variables

The variables ANSWER1 to ANSWER9 are channel level variables you can use that are persistent during the whole life cycle of the logger.

7.8.5.6 Working with Multiple Channels

The following example shows how to calculate power consumption, in watts, based on the values of input channels. The present channel is used as the current, in amps, and the next channel is the voltage, in volts.

```
Sub EQN101( )
```

```
Dim Watts, Volts, Current, PowerFactor As Double
```

```
Dim VchanNum As Integer, VchanIndex As Integer
```

```
Dim x As MsgBoxResult
```

```
'*****Determine the voltage to use for the logging session
```

```
'equation assumes that the current channel plus 1 is the voltage source.
```

```
'If the current channel plus 1 is not found the equation will prompt the user to input the voltage
```

```
'ANSWER2 will hold the voltage value that is entered by the user
```

```
VchanNum = Logger.GetChannelNumberByIndex(CurrentChannelIndex) + 1
```

```
VchanIndex = Logger.GetChannelIndexByNumber(VchanNum)
```

```
If VchanIndex <> -1 Then
```

```
    'force to calculate engineering value of channel 'VchanIndex
```

```
    Volts = Logger.GetChannelReading(VchanIndex)
```

```
Else
```

```
    If ANSWER1 = 0 Then
```

```
        ANSWER2 = CDBl(InputBox("Enter the nominal voltage during the logging session:", "Voltage Input"))
```

```
        ANSWER1 = 1
```

```
    End If
```

```
    Volts = ANSWER2
```

```
End If
```

```
'*****
```

```
'*****determine if power factor is needed
```

```
'if the user does not want to use power factor then the equation will default a power factor of 1
```

```
'ANSWER4 will hold the power factor value
```

```
If ANSWER3 = 0 Then
```

```
    x = MsgBox("Do you want to include the power factor?", vbYesNo, "Power Factor")
```

```
    If x = vbYes Then
```

```
        ANSWER4 = CDBl(InputBox("Enter the nominal power factor for the logging session:", "Power Factor Input"))
```

```
    Else
```

```
        ANSWER4 = 1
```

```
    End If
```

```
    ANSWER3 = 1
```

```
End If
```

```
PowerFactor = ANSWER4
```

```
'*****
```

```
'Invoke equation: 0-250 Amps AC, A60FL for logger: 12bit Logger, channel: AC Current AMPROBE
```

```
'You may replace ANSWER0 with your own parameter and assign the statement to a boolean.
```

```
Eqn("517DF8952F7142c0A70EEC21A23E6AA8", ANSWER0)
```

```
Current = ANSWER0
```

Watts = Current * Volts * PowerFactor
ANSWER0 = Watts

End Sub

7.9 **APPENDIX B Compound Line Equations**

Compound Line Equations

7.9.1 **Compound Line Equation Language**

Compound line equations in TrendReader Standard 2 use the VB.Net language. Therefore, any code in an equation must be compliant with the syntax of VB.Net. Although the equation script is VB.Net compliant, you cannot use all VB.Net methods and functions because some method related references may not be added to the equation project. Currently, all equation projects have **Microsoft.VisualBasic** and **System** references imported, so any functionality and definitions under these two references can be implemented. For detailed information please refer to VB.Net documentation.

The code for compound line equations and regular equations is very similar. See [APPENDIX A Equation Language](#) for more details on regular equations. The main difference between the two is the use of public variables and objects.

The public variables available in compound line equations are: SOURCE0, ..., SOURCE9, and ANSWER0, ..., ANSWER9. Whereas the SOURCE variables represent properties such as sample rate, calibration values, and compensation values for regular equations, in compound line equations they are used to input data into the equation. For example, to calculate watts, you need voltage, current, and power factor correction. In your equation, you could use SOURCE0 to represent voltage, SOURCE1 for current, and SOURCE2 for power factor correction. When you add the compound line equation in your graph, you would be asked to enter values for SOURCE0, SOURCE1, and SOURCE2. You would select which logger channel corresponds to SOURCE0 and SOURCE1 and possibly enter a constant for SOURCE2. You can associate a logger channel or a constant to a SOURCE variable.

ANSWER0 is used the same as for regular equations: to store the result of the equation. The variables ANSWER1 to ANSWER9 are channel level variables you can use that are persistent during the whole life cycle of the logger, such as for time accumulation type equations.

An object is a software entity which can be used in equations. An object includes properties and methods which can be invoked by equations. For compound line equations, you only have access to the Logger object, which is a software representation of the physical logger. The only property associated with the Logger available for compound line equations is the sample rate, stored as type Double, Logger.SampleRate (in seconds).

An example of a compound line to calculate total Watt Hours is shown below:

```
Sub Equation()
```

```
Dim Watts As Double
Dim Hours As Double
```

```
'SOURCE0=voltage, SOURCE1=current, SOURCE2=power factor correction
Watts=SOURCE0*SOURCE1*SOURCE2
```

```
Hours=Logger.SampleRate/(60*60)
```

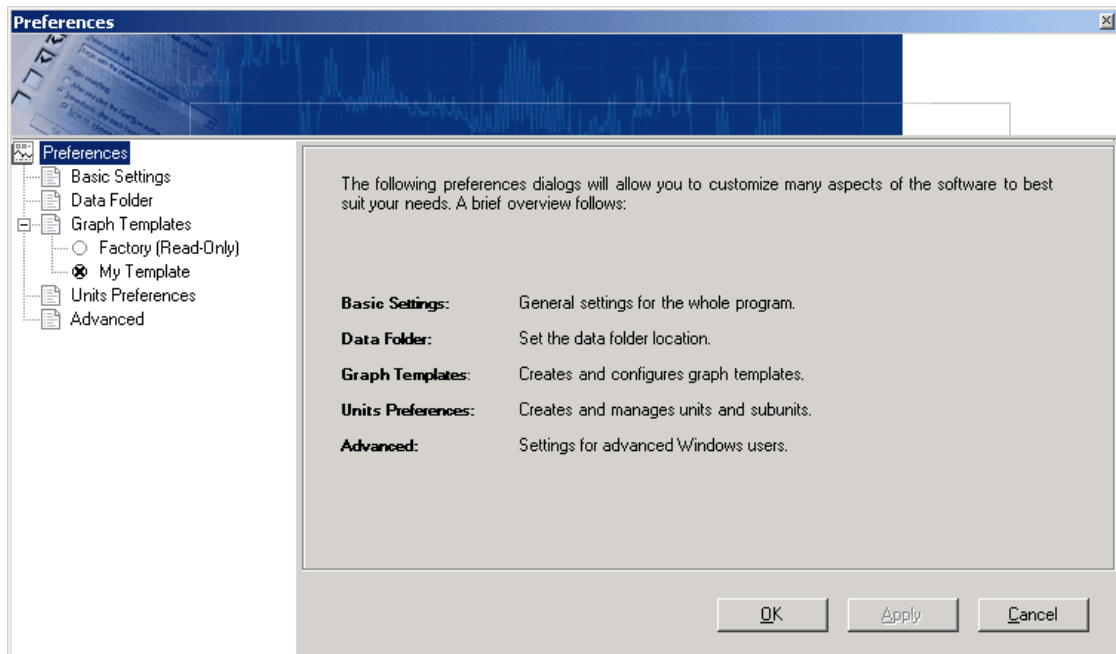
```
ANSWER1=Watts*Hours + ANSWER1 'Accumulate Watt Hours over time
ANSWER0=ANSWER1
```

End Sub

SECTION 8 Preferences

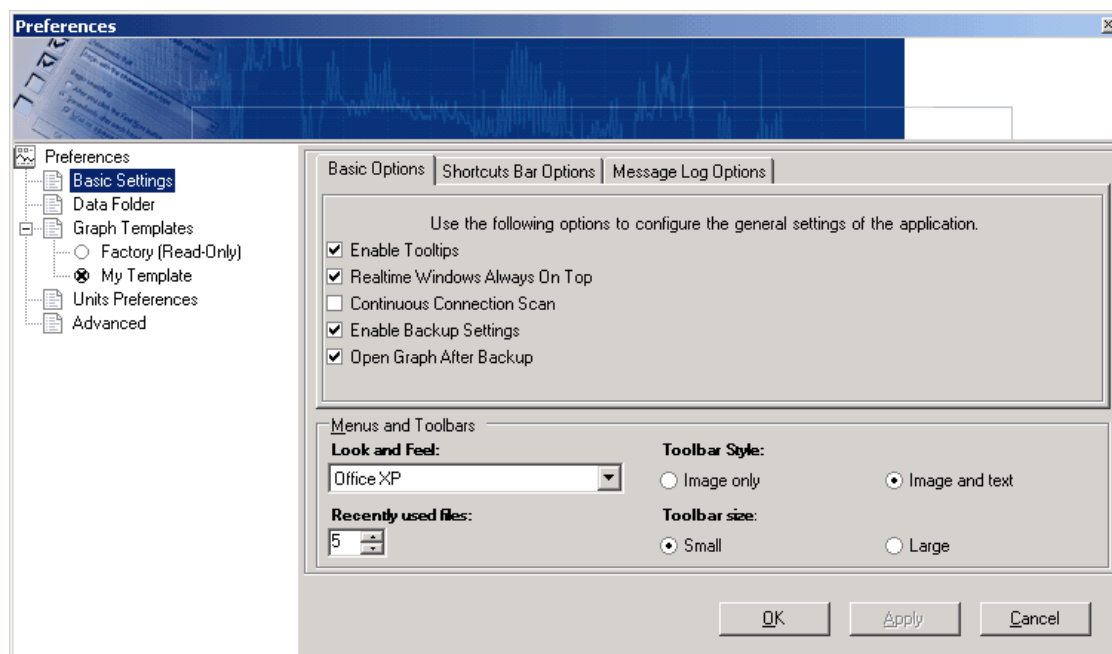
8.1 Introduction to Preferences

You can customize the way TrendReader Standard 2 appears and operates with selections available in Preferences, located in the Tools Menu. Click on the desired topic in the Preferences Tree to bring up the topic. [Basic Settings](#) allow you to set preferences that apply to the entire program. In [Data Folder](#) you set the default directory where the logger data files will be stored. With [Graph Templates](#) you can customize graphs, graph templates, and Realtime units. [Units Preferences](#) allows you to create and manage units. The [Advanced](#) section is for features that optimize the system.



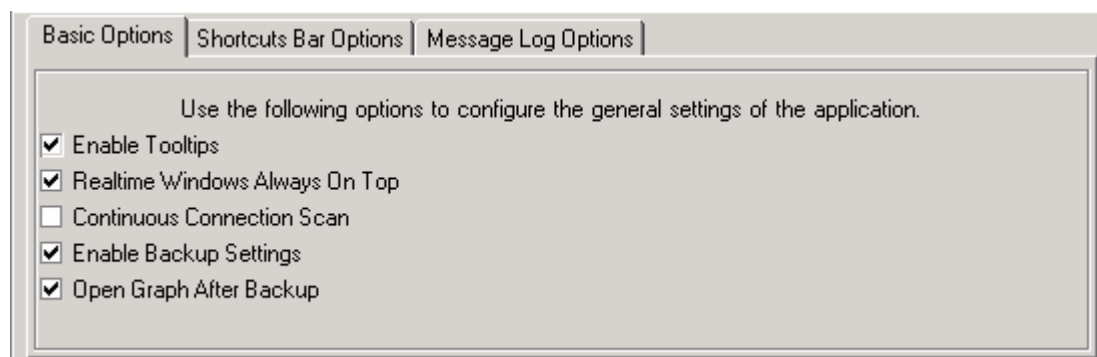
8.2 Basic Settings

Basic Settings has [Basic Options](#) that allow you to set whether certain items are displayed in the program and how the program performs specific actions. You set startup views in [Shortcut Bar Options](#) and [Message Log Options](#). In Basic Settings you set how [Menus and Toolbars](#) look. To implement your selections, you can either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes to other features.



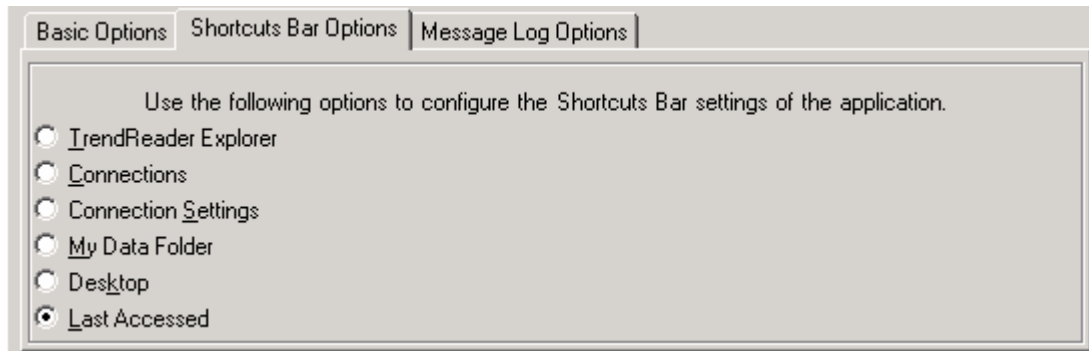
8.2.1 Basic Options

In the Basic Options section of the Basic Settings, you set whether you want to display Tooltips and if Realtime Windows are always shown on top. You can set the program to Continuously Scan for Connections, enable the entry of Backup Settings upon backup, and choose if you want to automatically Open a Graph when a Backup Finishes. Click the box beside the item to enable or disable it.



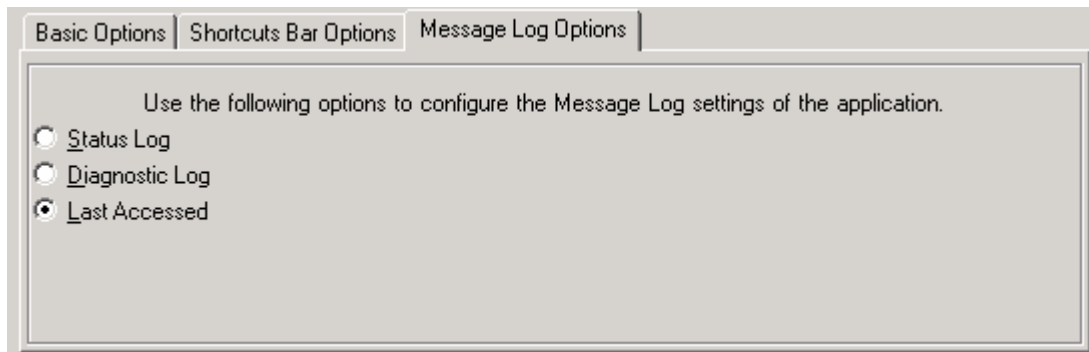
8.2.2 **Shortcut Bar Options**

In the Shortcut Bar Options section of the Basic Settings, you choose what Shortcuts view you want to see when the program is started. You can choose from TrendReader Explorer, Connections, Connections Settings, Data Folder, Desktop, or Last Accessed. If you choose Last Accessed, you will be shown the view you had when you last exited the program. Click the button beside the view that you want.



8.2.3 **Message Log Options**

In the Message Log Options section of the Basic Settings, you choose which Message Log you want to see when the program is started. You can choose from Status Log, Diagnostic Log, or Last Accessed. If you choose Last Accessed, you will be shown the log you had when you last exited the program. Click the button beside the log that you want.



8.2.4 **Menus and Toolbars**

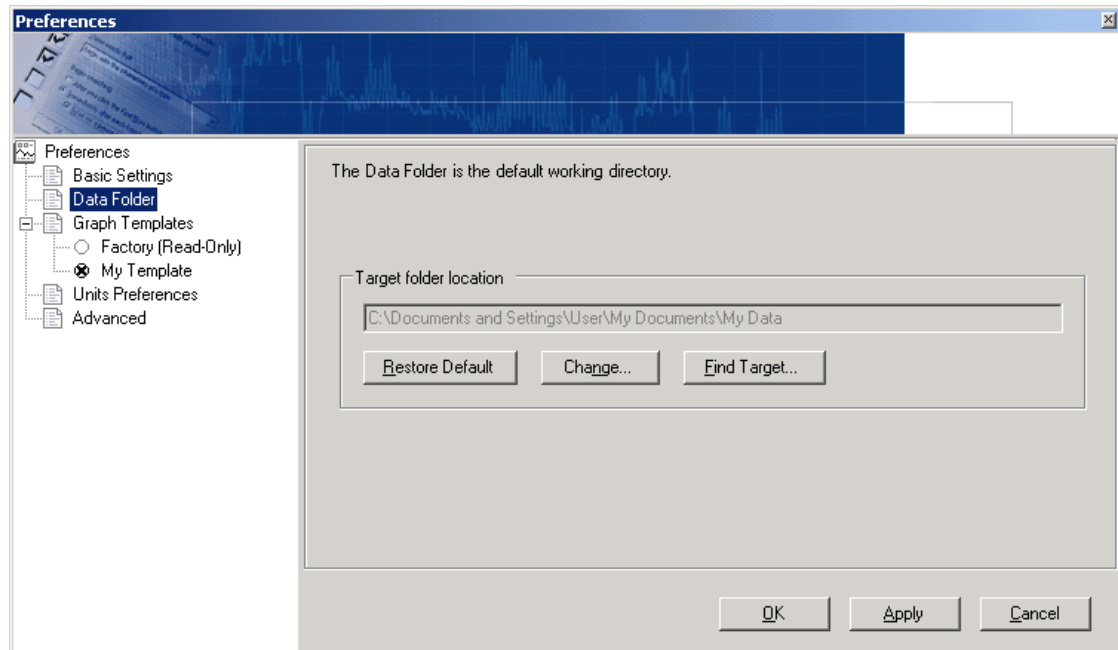
In the Menus and Toolbars section of the Basic settings, you set how you want the program to appear. For the Look and Feel, select a style from the drop-down list. Options available include: Classic, Office 2003, Office XP, and Windows XP. To select the number of Recent Files to display, you can either use the up and down buttons or highlight the text and enter in a number.

If you select Image and text as a Toolbar Style, icons will be displayed with an image and a description of the function, otherwise, only the image is shown. You can also choose either a small or large size for the Toolbar.

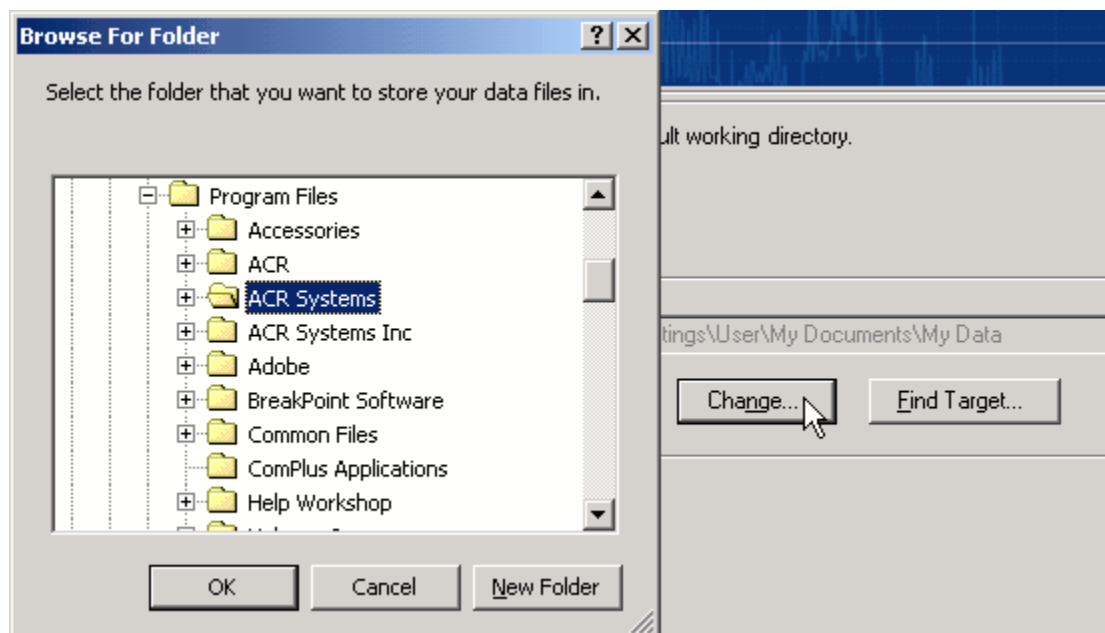


8.3 Data Folder

The Data Folder is used as the default location for storing your logger data files. The folder is accessed through Data Folder in the Shortcuts Bar.



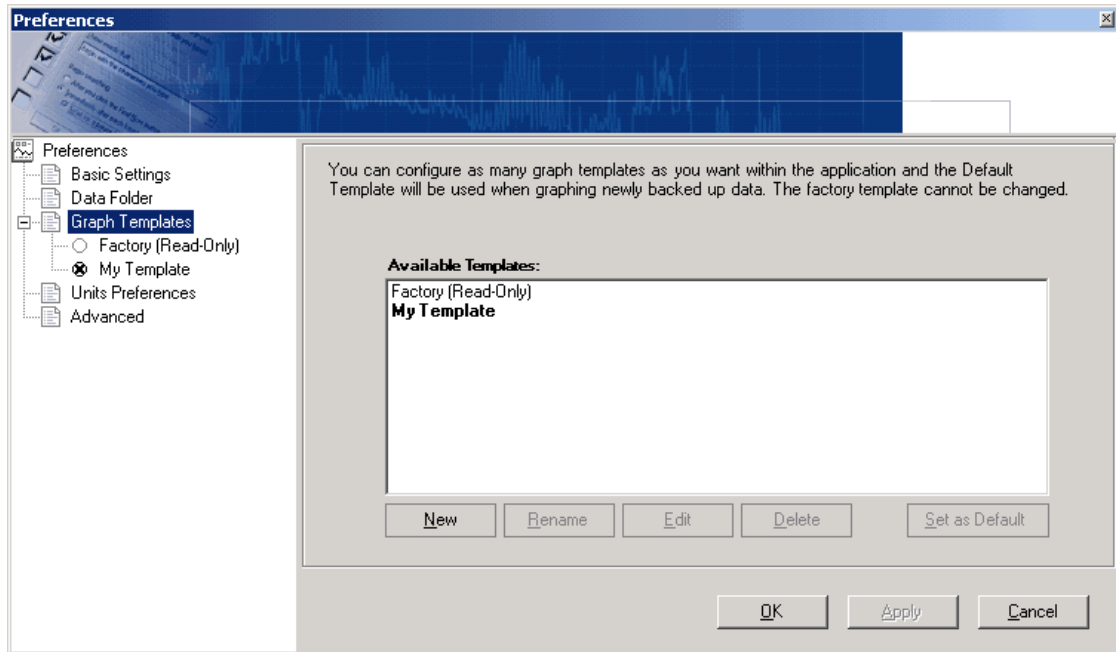
If you click on **Restore Default**, the folder will be set to the default folder. Click on **Change** to select a new folder for storing your data files. This will pop up a window allowing you to navigate to select the folder or create a new folder. To see the files in the folder, click on **Find Target**.



Note the changes will only be implemented if you either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other features.

8.4 Graph Templates

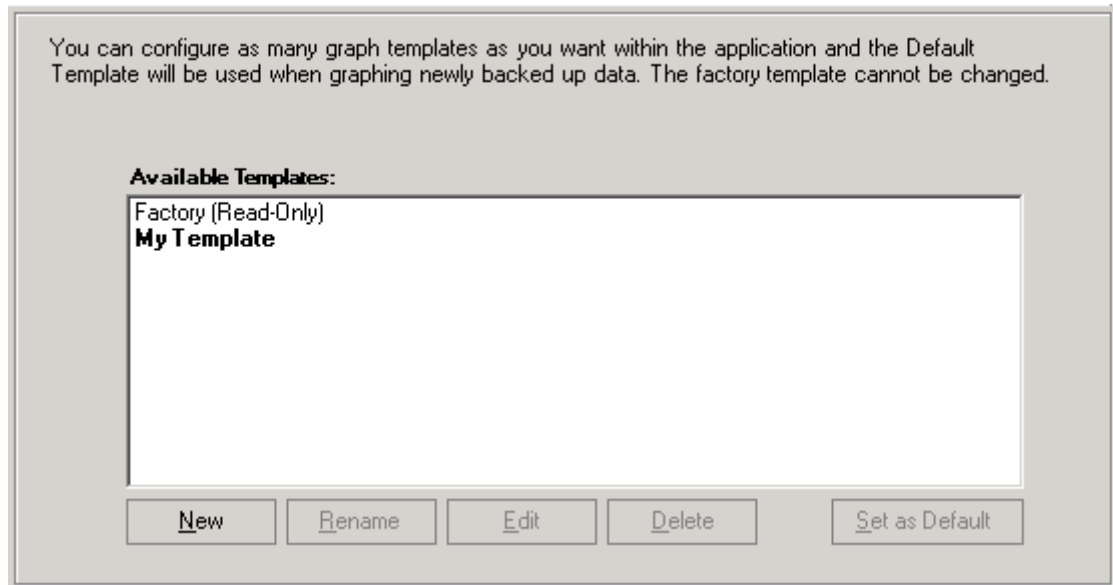
Graph Templates allow you to manage and create templates that are used to format graphs and Realtime units. You can use the factory default template or you can create your own through the [Templates Window](#) or the [Graph Templates Tree](#). Check Templates in the Graph section to see how to use templates with graphs.



Note that the template changes will only be implemented if you either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other features.

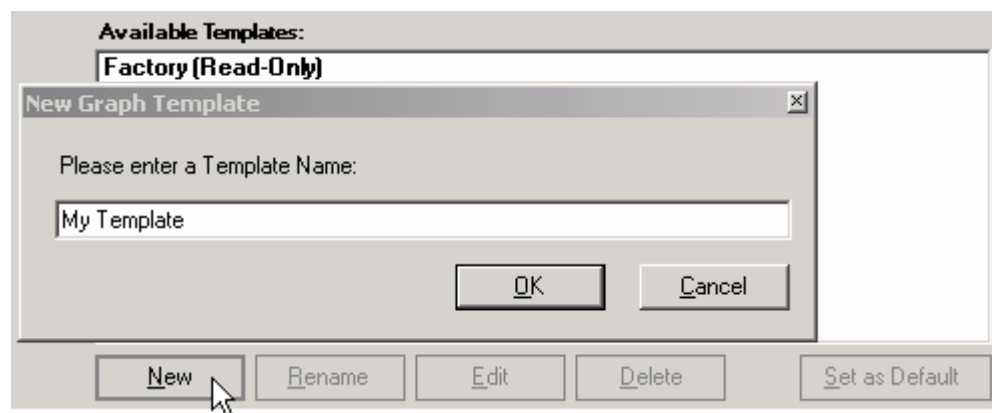
8.4.1 Templates Window

When you click on Graph Templates in the Preferences Tree, you are shown the Templates Window. Here, you can create, rename, edit, delete, or set a default template. The main screen shows you all the templates available in the system, while the buttons below allow you to perform the functions. The default template is applied to the graph when a logger is backed up, a *.TRW or *.GPW file is opened, files are opened from the Graph List, or a logger is Realtime. The default template is shown in bold. Note that the Factory Template cannot be deleted, renamed, or edited.



New Template

1. To add a new template, click on **New** to pop up a name form.
2. Enter the name and click **OK**.
3. The new template will have the same properties as the current default template. Click on **Edit** to set the preferences for this template.



Rename

1. To rename a template, highlight the template in the main screen.
2. Click on **Rename** to pop up a name form.
3. Enter the name and click **OK**.

Edit

1. To edit a template, highlight the template in the main screen.
2. Click on **Edit** to replace the Templates Window with the Graph Settings Window.
3. If you want to learn more about the preferences, see the [Graph Templates Tree](#).

Delete

1. To delete a template, highlight the template in the main screen.
2. Click on **Delete** to pop up a confirmation form.
3. Click **Yes** if you are sure you want to delete the template. The template will be marked for deletion and will be removed when you save the changes.

Set as Default

1. To set a template as the default, highlight the template in the main screen.
2. Click on **Set as Default**.

8.4.2 **Graph Templates Tree**

The Graph Templates Tree, like the [Templates Window](#), allows you to create new templates, rename or delete templates, or set a default template. The difference is that you right-click to pop up menus instead of clicking on buttons. The default template is shown with an "X" in the bubble beside its name. Note that the Factory Template cannot be deleted, renamed or edited.

New Template

1. To add a new template, right-click on Graph Templates and select **New Template** to pop a name form.
2. Enter the name and click **OK**.
3. See [Setting Graph Preferences](#) below to learn how to set the preferences for this template.

Rename

1. To rename a template, right-click on the template name in the Graph Templates Tree.
2. Select **Rename** to pop up a name form.
3. Enter the name and click **OK**.

Delete

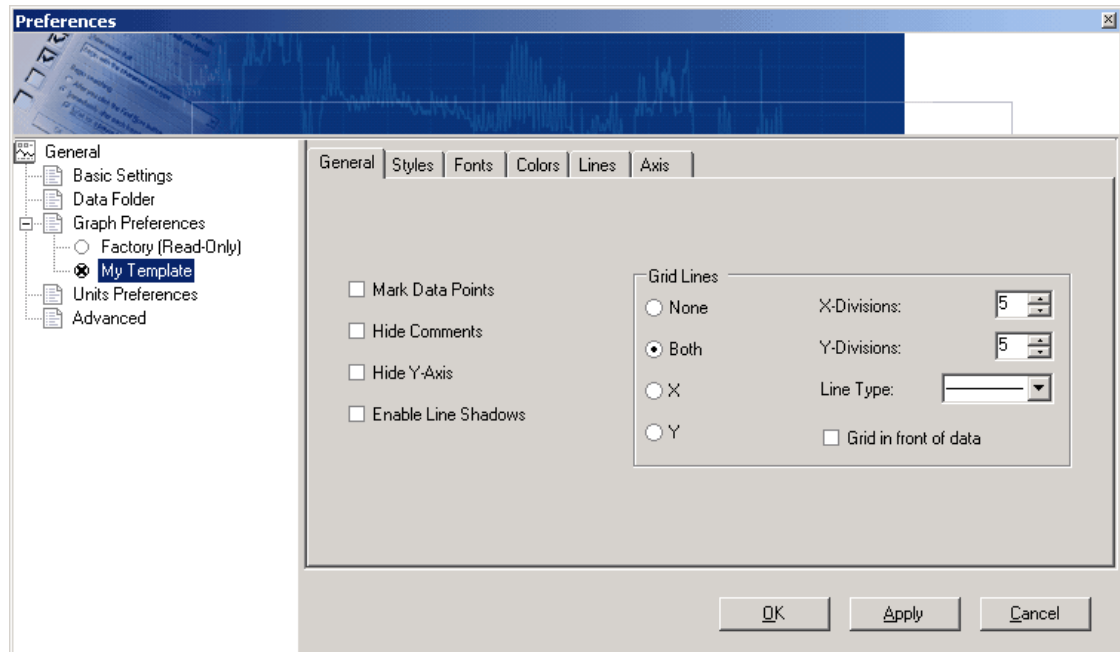
1. To delete a template, right-click on the template name in the Graph Templates Tree.
2. Select **Delete** to pop up a confirmation form.
3. Click **Yes** if you are sure you want to delete the template. The template will be marked for deletion and will be removed when you save the changes.

Set as Default

1. To set a template as the default, right-click on the template name in the Graph Templates Tree.
2. Click on **Set as Default**.

Setting Graph Preferences

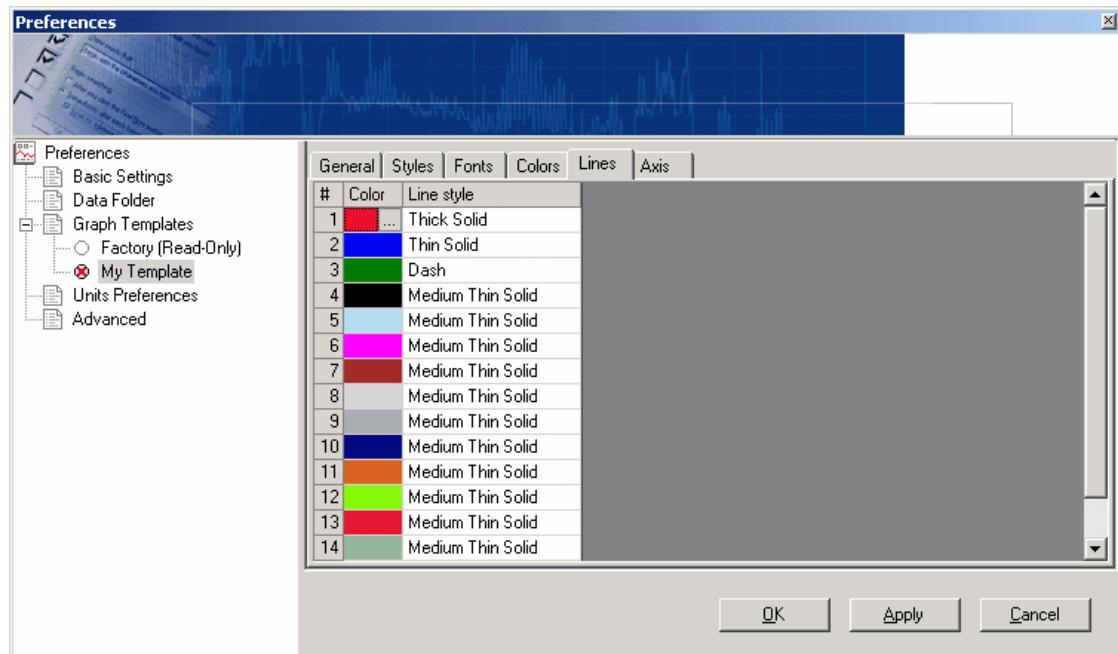
When you click on a template name in the Graph Templates Tree, the Templates Window changes to the Graph Settings Window. Click on the various tabs and set the listed properties as you see fit. See Graph Settings for a detailed description. Note that the settings for subunits and precision, in the Axis Tab of the default template, will be used for displaying the Realtime values. For example, you could choose to see temperatures rounded to the nearest degree in Fahrenheit in the logger status window by setting the appropriate properties of the Temperature unit of the default template.



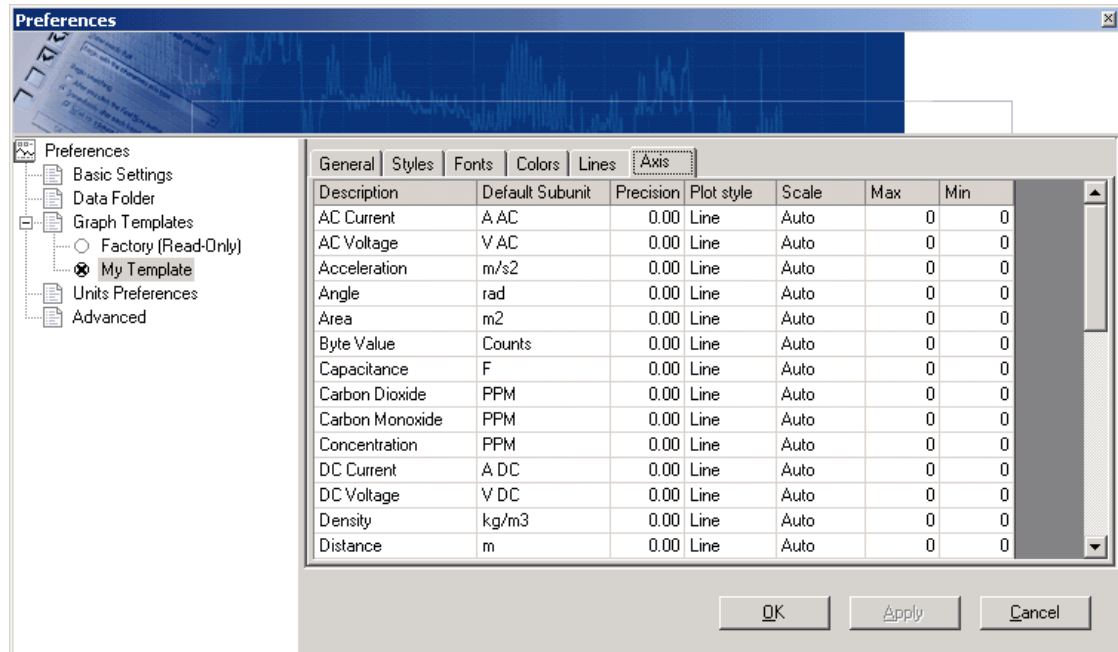
Differences Between Preferences and Graphs

While most of the graph settings shown in Preferences are the same as those that appear in the Graph Settings window on a graph, the Lines and Axis Tabs are different. The main difference is that in the graph's Graph Setting window, you only see properties that apply to the specific channels shown in the graph.

In the Lines Tab of the graph settings in Preferences, you see information about line colour and style. You select the order in which to apply the line color and style to the channels in a graph. For example, you may specify that the first line is a thick, solid red line; the second is a thin, solid blue line; the third is a dashed green line, and so on. In the graph's Graph Setting window, you will only see as many line colors and styles as there are channels. You will also see information for that specific channel, including the channel description, equation, and calibration values.

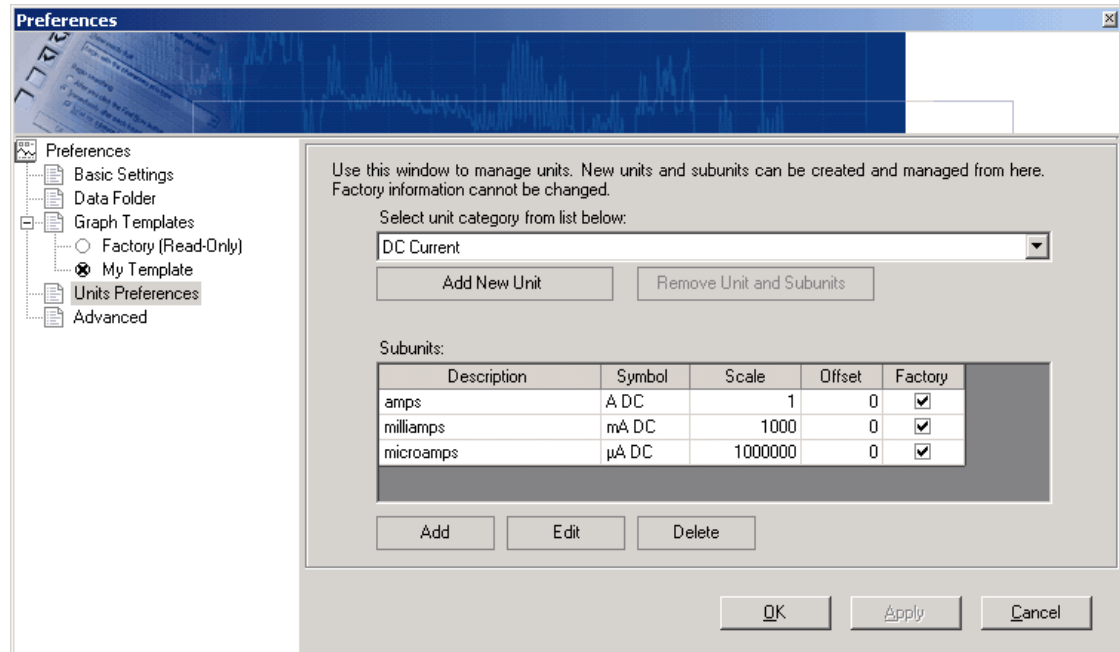


In the Axis Tab of the graph settings in Preferences, you see information about all the units. For each unit you set the default subunit, precision, plot style and scaling that will apply to the channels in a graph. For example, you may specify that all DC voltage channels will be displayed in millivolts, rounded to a whole number, and plotted as a spline. In the graph's Graph Setting window, you will only see the selections for the units that are present in the graph. For example, if you have a voltage and temperature logger, you will see an entry for voltage and an entry for temperature.



8.5 Units Preferences

Unit Preferences allows you to see, manage and create the units used by the equations. Each unit has a description, a base subunit and possibly several other subunits. For example, the unit DC current has Amps as its base subunit and milliamps and microamps as other subunits. The base subunit is listed first. Each subunit has a description, symbol, and a scale and offset. The scale and offset are used to convert values from the base subunit to other subunits.



Note that you cannot edit, delete, or remove factory units and subunits. Also, if you need to use a special character, such as "°" for degrees, for the symbol, click on the Map of Characters in the Subunit form to pop the standard character map. From the character map, you can copy the symbol and paste it into the Subunit form. Note that not all symbols can be displayed on the graph.

Adding a New Unit

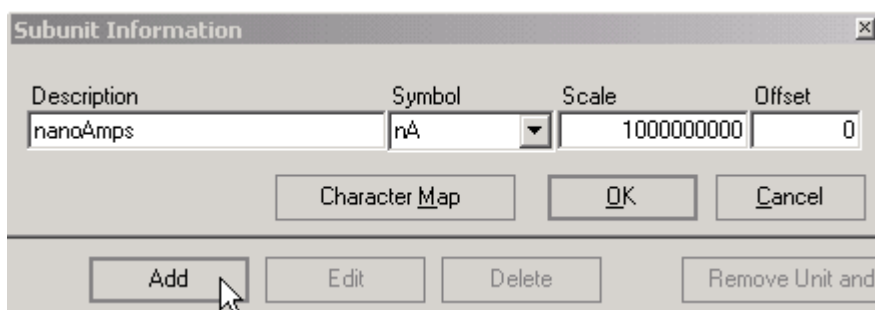
1. Click **Add New Unit** to pop up a Unit form.
2. Enter the Name of the category unit.
3. Enter the Description and Symbol for the base subunit. For the Symbol, you can select an existing one from the drop-down list or you can enter your own. The Scale and Offset are automatically set to 1 and 0 respectively.
4. Click **OK**.

Remove Unit and Subunits

1. To delete a unit and all its subunits, click on the drop-down list to select the unit category.
2. Click **Remove Unit and Subunits**.
3. Click **Yes** in the confirmation dialog box that pops up.

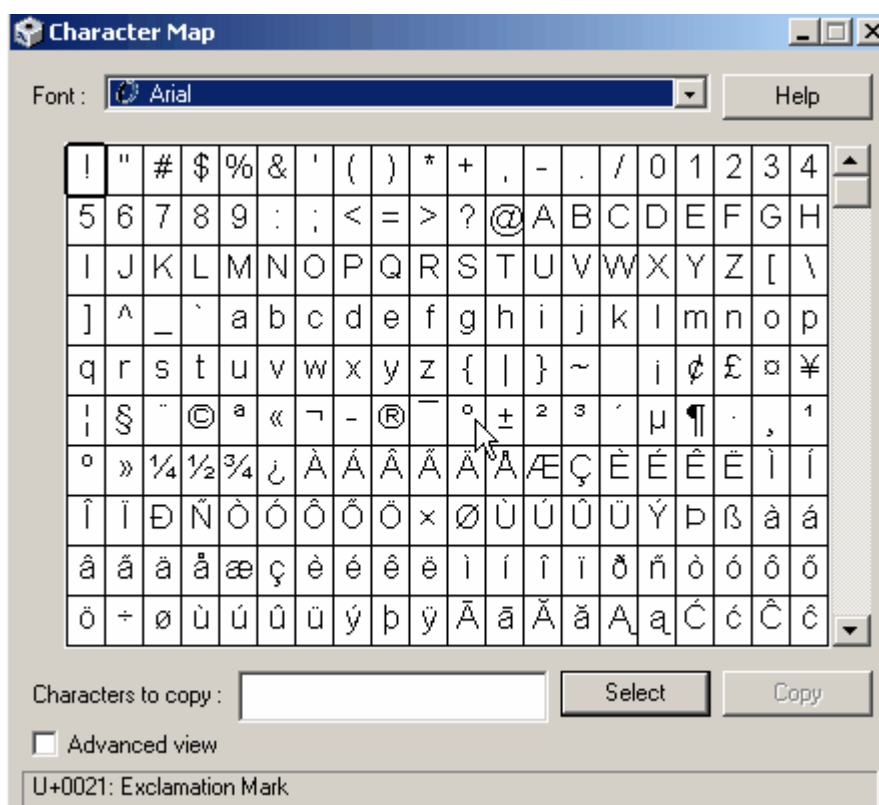
Adding a Subunit

1. To add a subunit to an existing unit, click on the drop-down list to select the unit category.
2. Click **Add** to pop up a Subunit form.
3. Enter the Description, Symbol, Scale and Offset. For the Symbol, you can select an existing one from the drop-down list or you can enter your own.
4. Click **OK**.



The 'Subunit Information' dialog box contains the following fields and buttons:

- Description:** nanoAmps
- Symbol:** nA (selected from a drop-down list)
- Scale:** 1000000000
- Offset:** 0
- Buttons:** Character Map, OK, Cancel (top row); Add, Edit, Delete, Remove Unit and S (bottom row).



The 'Character Map' dialog box displays a grid of characters and includes the following elements:

- Font:** Arial (selected from a drop-down list)
- Help:** button
- Character Grid:** A 10x16 grid of various characters including punctuation, numbers, letters, and special characters. A mouse cursor is pointing at the character '±' in the 5th row, 14th column.
- Characters to copy:** text box (currently empty)
- Select:** button
- Copy:** button
- Advanced view:** checkbox (unchecked)
- Status Bar:** U+0021: Exclamation Mark

Edit a Subunit

1. To edit a subunit, click on the drop-down list to select the unit category.
2. Click on the subunit you want to edit.
3. Click **Edit** to pop up a Subunit form.
4. Enter the Description, Symbol, Scale and Offset. For the Symbol, you can select an existing one from the drop-down list or you can enter your own. If this is a base subunit, the Scale and Offset are automatically set to 1 and 0 respectively.
5. Click **OK**.

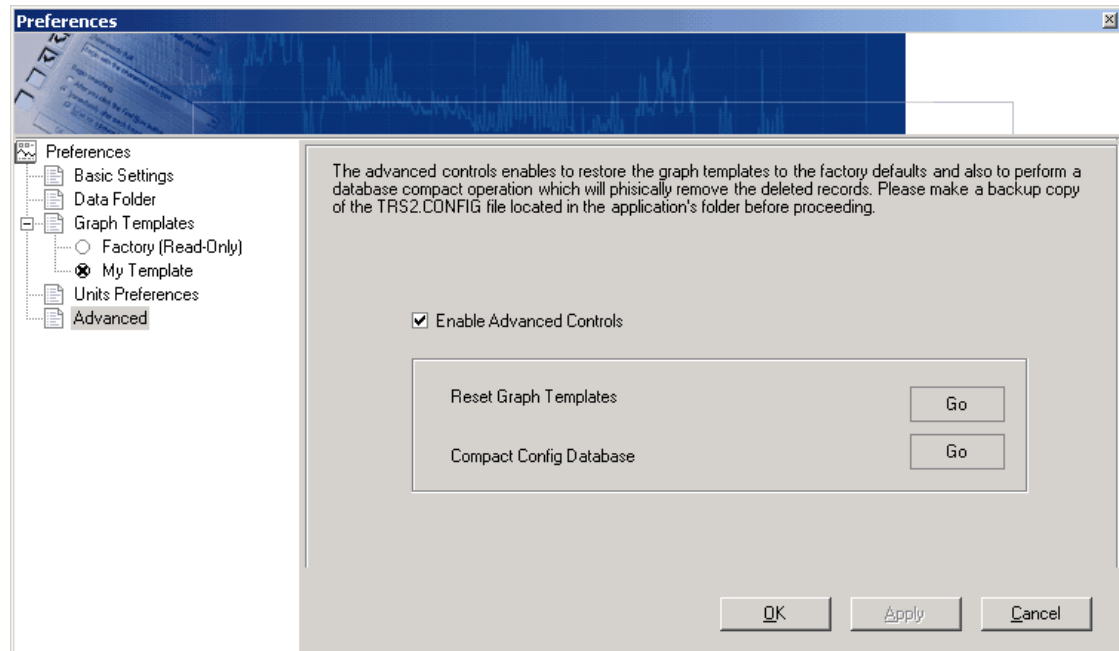
Delete a Subunit

1. To delete a subunit, click on the drop-down list to select the unit category.
2. Click on the subunit you want to delete. Note that the base subunit cannot be deleted.
3. Click **Delete**.
4. Click **Yes** in the confirmation dialog box that pops up.

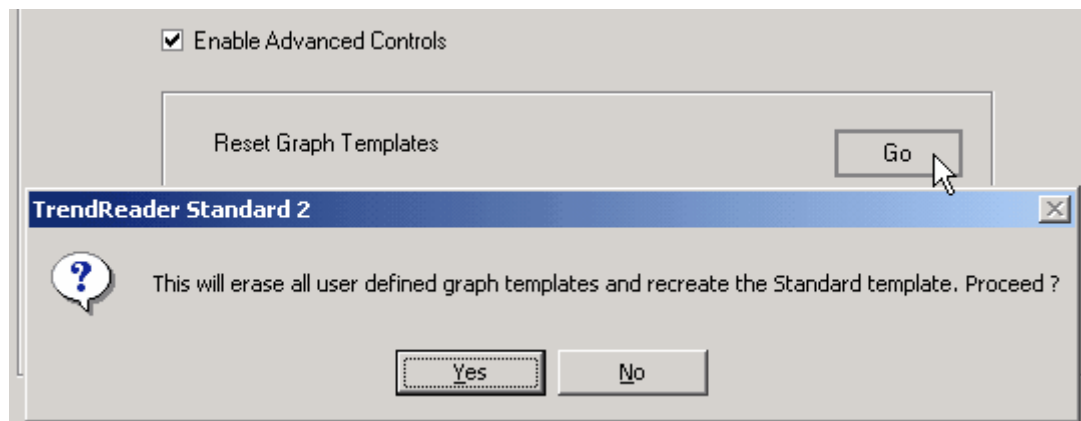
Note the changes will only be implemented if you either click on **Apply** or **OK**. OK will implement the changes and close the window whereas Apply will leave the window open, thereby allowing you to make changes in other features.

8.6 **Advanced**

The Advanced section allows you to Reset the Graph Templates and Compact the Preferences Database. Resetting the templates will remove any user-defined templates. Compacting the database will remove deleted records and increase its performance.



To perform these operations, you must first Enable the Advanced Controls. Then simply click on **Go** beside the operation that you want to perform. Click **Yes** in the confirmation dialog box that pops up.



SECTION 9 Modems

9.1 **Introduction to Modems**

Modems allow you to communicate, over telephone lines, with loggers at remote sites. A remote logger behaves the same as if it were connected directly to your computer. Modems can relieve you of the need to physically go to the remote location to communicate with a logger.

Equipment Needed

To communicate with a remote logger you will need:

- A telephone line to the remote logger site.
- Two modems: one at your computer and one at the remote logger site. These modems should respond to AT commands.
- At least one standard modem cable. This cable connects a modem to your computer.
- An IC-101 interface cable at the remote site.

If you are communicating with only one logger, you can use an IC-101 and a 9 to 25 pin adapter, plus an MA-100(a null modem adapter).

For communicating with multiple SmartReader Plus loggers, you will need a YA-200 stereo Y adapter / cable or YA-201 for each additional logger.

9.2 **Connecting the System**

Computer Station

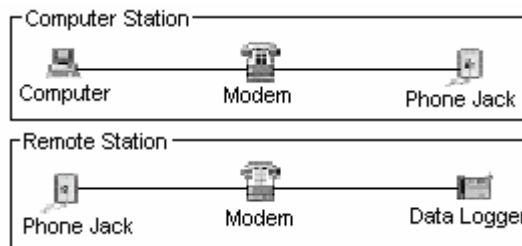
The computer station consists of your computer and a modem. From one computer station, you can call an unlimited number of remote logger stations.

1. When communicating with an external modem, connect it to your computer using a standard modem cable. (This is the same as a serial port cable).
2. Connect the modem to a phone jack.

Remote Logger Station

The remote logger station consists of any one of the following combinations:

- A.** One SmartReader or SmartReader Plus logger connected to:
 1. an IC-101 interface cable and a 9 to 25 pin adapter which connects to
 2. an MA-100 null modem adapter, which connects to
 3. a modem
- B.** Multiple SmartReader Plus loggers connected together with YA-200 Y adapters or YA-201 to:
 1. an IC-101 interface cable and a 9 to 25 pin adapter which connects to
 2. an MA-100 null modem adapter, which connects to
 3. a modem



9.3 **Configuring Modems**

To communicate with remote data logger sites, the modems have to be configured properly. The computer modem and remote site modem each require their own setup parameters. The number of modem makes and models is so large it is impractical to produce a comprehensive list of settings. The following setup is for the popular US Robotics Sportster 56K fax modem.

9.3.1 **Setting up the Computer Station**

Application programs on a computer usually issue initial commands to modems to establish their setup. When the application is terminated, other programs are free to re-configure the modem. In TrendReader Standard 2, you can set up the modem's required configuration in the Modem section of the Connection's settings. The commands are sent to the modem to initialize it before placing a call to the remote logger site.

9.3.1.1 **DIP Switch Settings**

Set the DIP switches for the computer station's modem as follows (or equivalent settings if you are using a different brand of modem):

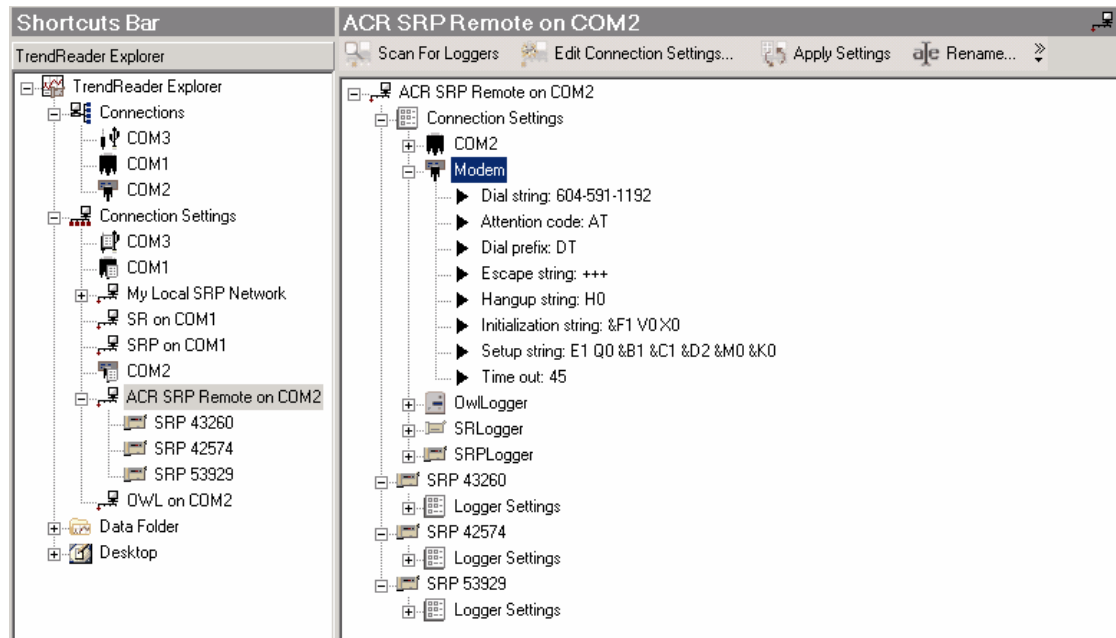
1	UP	Normal DTR operation
2	UP	Verbal result codes
3	DOWN	Result codes enabled
4	UP	Echo offline commands
5	UP	Auto answer enabled
6	UP	Normal CD operation
7	UP	Load user defaults
8	DOWN	AT command recognition

9.3.1.2 **Software Configuration**

In TrendReader Standard 2, you can set up the modem's required configuration in the Modem section of the Connection Settings. While you can configure the settings for the COM Port in Connections, it is better to save it as a connection in Connection Settings. This way, you only

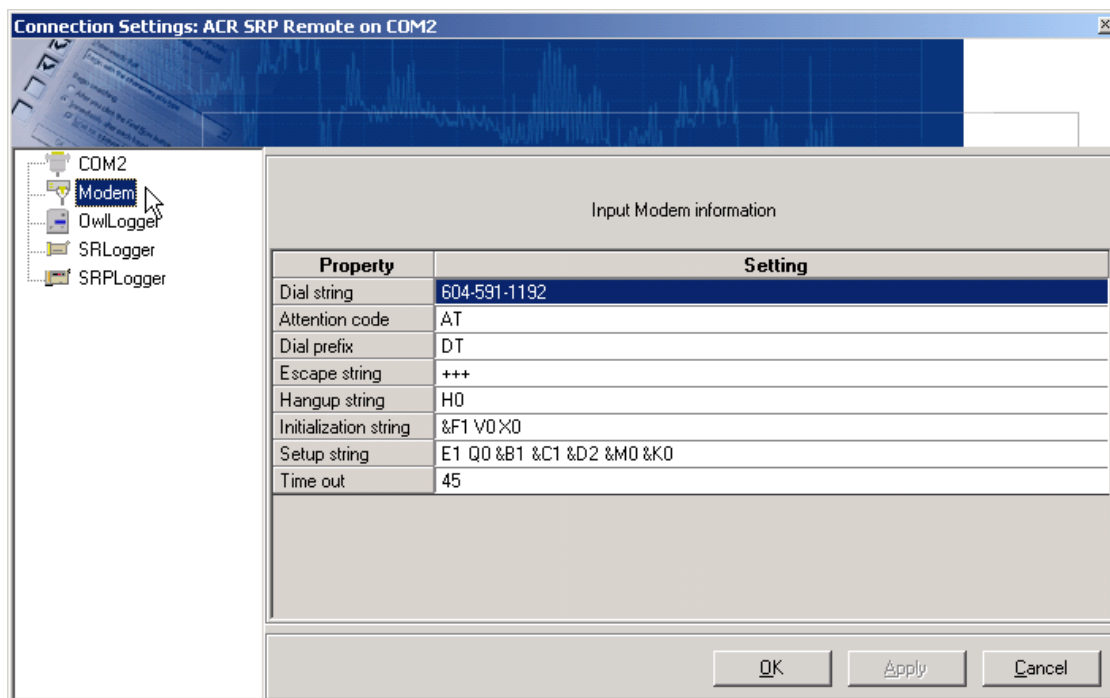
need to configure the settings once and you simply select the connection when you want to connect to your remote loggers. If you have multiple remote sites, create a connection for each one. See Connection Settings for information on connections.

You can view the settings by selecting the connection in Connection Settings. The settings will be shown in the Work Area. Click on a node to expand it and view the details.

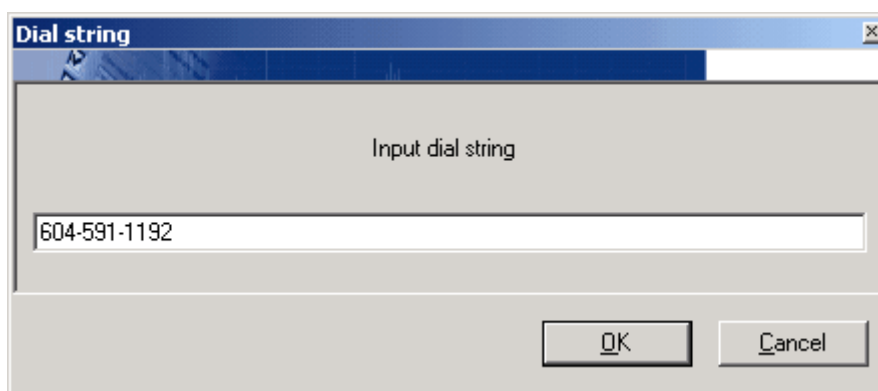


The modem settings shown in the window are the defaults for the US Robotics Sportster 56K fax modem. To change a setting:

1. Select the connection.
2. Select **Edit Connection Settings** from the Actions Menu.
3. Select the Modem node.

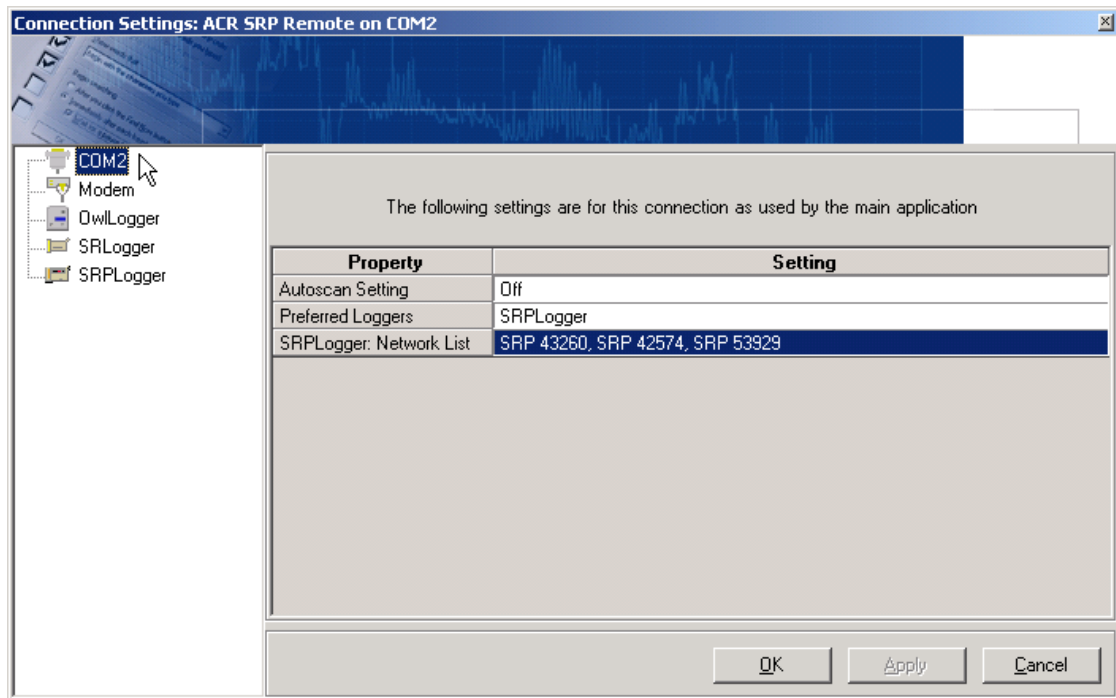


4. Click in the text field you want to change.
5. A window will pop up allowing you to enter the new setting.



6. Click **OK** to save the setting and close the pop up window.
7. In the main settings window, click **Apply** to save the changes.

If you have a network of loggers at the remote site, you will need to enter them in the COM port settings tab.



The following sections describe the various modem settings.

9.3.1.2.1 Dial String

The Dial String is the phone number of the remote logger. You can enter the phone number with parentheses, spaces, dashes or just numbers. For example, (123) 456-7890, 123 456 7890, 123-456-7890, and 1234567890, are all valid representations.

9.3.1.2.2 Attention Code

The Attention Code prefixes all command strings.

AT Attention (command prefix)

9.3.1.2.3 Dial Prefix

The Dial Prefix is used before the number dialed to issue a dial command, either:

DT Tone dial for Touch-Tone phone lines

DP Pulse dial for rotary phone lines

Numbers can be appended to access outside lines or long distance suppliers. A **"W"** after the number causes the modem to wait for another dial tone. For example, **DT9W** tone dials 9 then waits for another dial tone before dialing the number.

9.3.1.2.4 Escape String

The Escape String forces the modem into command mode while a link is established.

+++ Escape sequence

9.3.1.2.5 Hangup String

The Hangup String is used to disconnect the modem.

HØ Go on-hook

9.3.1.2.6 Initialization String

The Initialization String is a command that clears the modem of any previous setup and puts it in a known operating state.

&F1 Load factory defaults (hardware flow control)

VØ Numeric result codes

XØ Set range for result codes

9.3.1.2.7 Setup String

The Setup String determines the modem parameters such as handshaking, protocol, etc. If your modem does not work with the parameters shown, consult the modem manual to find the equivalent settings.

E1 Echo offline commands

QØ Result codes enabled

SØ = 1

&B1 Fixed serial port rate

&C1 Normal CD operation

&D2 Normal DTR operation

&HØ Flow control disabled

&IØ Software control disabled

&MØ Normal mode-error control disabled

&KØ Disable data compression

9.3.1.2.8 Timeout

Timeout is the length of time your computer will wait for a remote site to answer before it hangs up.

9.3.2 Setting up the Remote Logger Station

The modem used at the remote logger site needs to be configured to work with data loggers. The timing of signals generated from TrendReader Standard 2 must be preserved over the modem link. High-speed modems have features such as data compression, error correction, extra buffers and proprietary protocols. These enhance computer-to-computer communications but interfere with data logger transmission.

To save yourself time and trouble, before you install at the remote site, set up your computer station and your remote logger station close to each other – preferably in the same building. Test their operation before you install at the remote site. Then, when you install at the remote site, have someone call the remote site from the computer station while you are still there.

9.3.2.1 Software Configuration

Connect the remote modem to your computer (you cannot configure a modem remotely). Then, set the remote modem's DIP switches to the same settings as the computer station modem.

To communicate with the modem you will need a terminal program, such as Hyperterminal available in Windows. In Windows, choose - **Start >> Accessories >> Hyperterminal** and then **Hyper Terminal**. When you have chosen the correct COM port:

1. Type: **AT & F** and press **Enter**. The modem should respond, "OK".
2. Type the following command string: **AT E0 Q1 S0=1 V0 &B0 &C0 &D0 &H0 &K0 &M0 &W** and press **Enter**.

The modem will not respond. This is normal. The modem response mode command **Q1** tells the modem not to respond to instructions. You have now correctly set up the modem for use at the remote logger station. The individual settings are described below:

- E0** Offline commands not echoed
- Q1** Result codes disabled
- S0=1** Auto Answer enabled (pick up after first ring)
- V0** Numeric result codes
- &B0** Serial port rate follows connection rate
- &C0** Override CD operation

- &DØ** Override DTR operation
- &HØ** Flow control disabled
- &IØ** Software flow control disabled
- &KØ** Data compression disabled
- &MØ** Error control disabled
- &W** Write settings to nonvolatile memory

9.3.2.2 DIP Switch Settings

After configuring the remote logger station modem, set the DIP switches as follows (or equivalent settings if you are using a different brand of modem).

1	DOWN	Override DTR operation
2	DOWN	Numeric result codes
3	UP	Result codes disabled
4	DOWN	Offline commands not echoed
5	UP	Auto Answer enabled
6	DOWN	Override CD operation
7	UP	Load user defaults
8	DOWN	AT command recognition

To verify that the settings are correct, type the following command.

AT I4<enter>

Note: You will not be able to see the above command being typed, but when the enter key is pressed the modem will respond with one or more screens to show the current settings. The screen should look similar to the following.

USRobotics Sportster 56K Fax Settings.

B0 E0 F1 M1 Q1 V0 X0 Y0
BAUD=9600 PARITY=N WORDLEN=8
DIAL=TONE ON HOOK

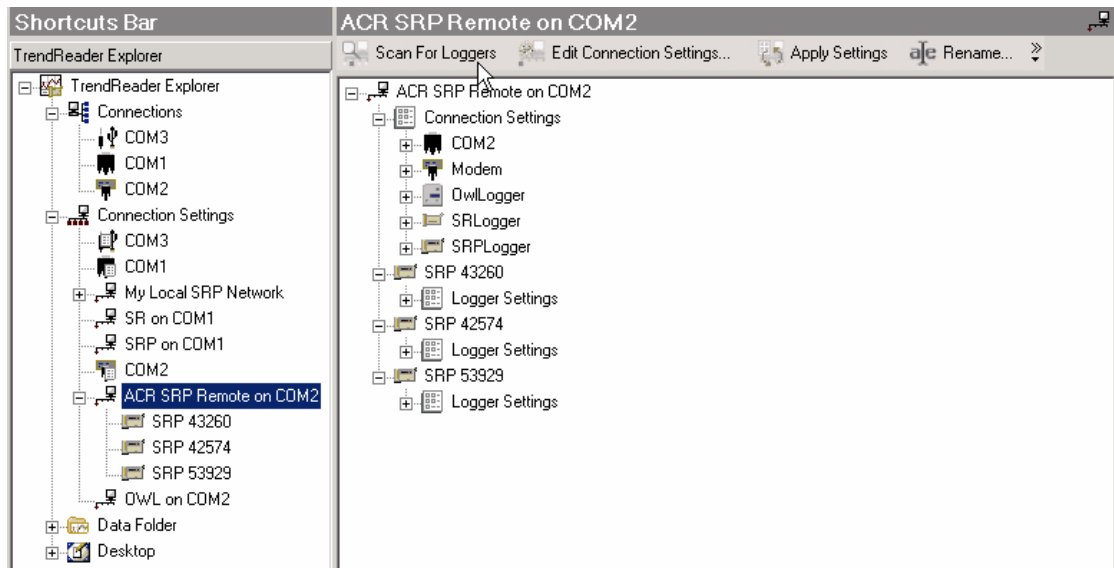
&A3 &B0 &C0 &D0 &G0 &H0 &I0 &K0 &M0 &N0
&P0 &R2 &S0 &T5 &U0 &Y1

S00=001 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060 S08=002 S09=006 S10=014 S11=070 S12=050 S13=000
S15=000 S16=000 S18=000 S19=000 S21=010 S22=017 S23=019
S25=005 S27=000 S28=008 S29=020 S30=000 S31=128 S32=002
S33=000 S34=000 S36=014 S38=000 S39=000 S41=000

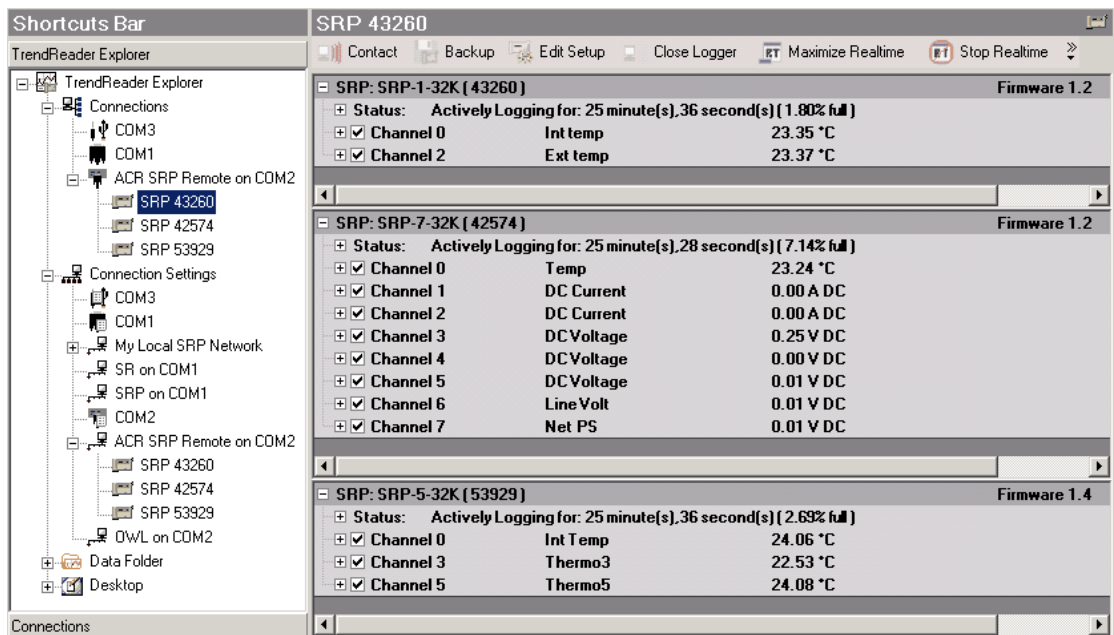
LAST DIALED # T71,5911192

9.4 Communicating with Remote Loggers

To contact the remote loggers, first select the remote site from the Connection Settings node of the TrendReader Standard 2 Tree in the Shortcuts Bar. Then select **Scan for Loggers**.



The modem will dial the number and contact and display the status of the loggers.

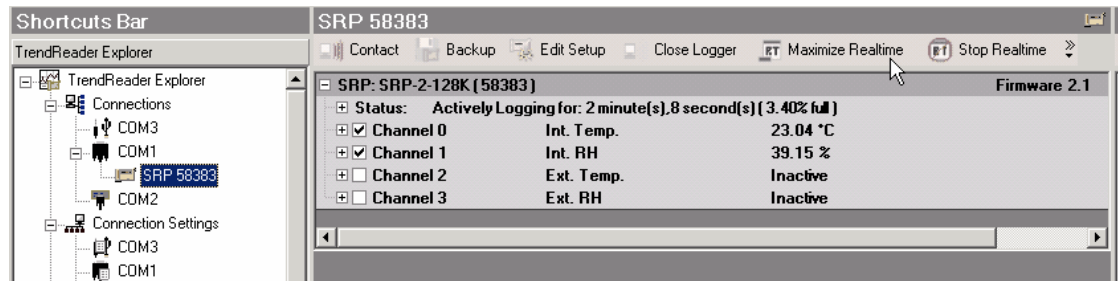


SECTION 10 Realtime

10.1 Introduction to Realtime

The data loggers take samples and store the readings in memory. To view all the stored data, either as a graph or a data table, you need to backup the logger. However, while the logger is connected to your computer, you can view the current sample, known as the Realtime value or reading, for each of the channels. You can use the Realtime value to monitor current conditions or to verify that you have selected the correct equation for a channel. Note that not all loggers have Realtime capability.

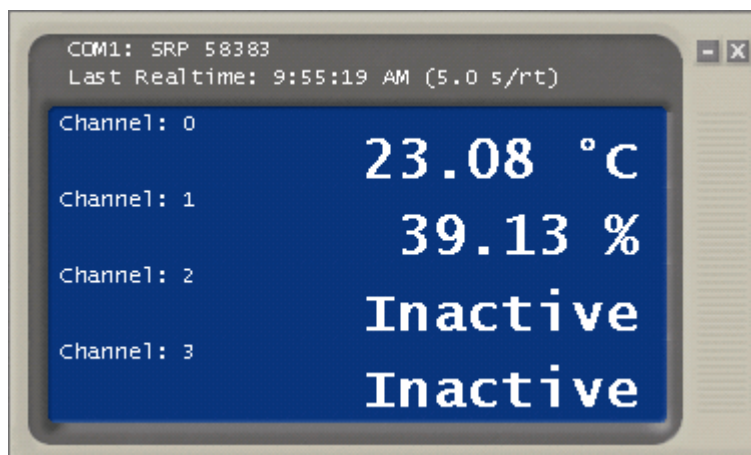
The Realtime values are displayed in the logger status window in the Work Area. (If Realtime has been stopped, you need to start it again.) If you want to see just the values and not the logger information, you can select Maximize Realtime to pop up the [Realtime Window](#). Note that if you are backing up the logger, the Realtime Window will be invalid during the backup. It will be restored once the backup is completed.



10.2 Realtime Window

The Realtime Window displays the values of the current sample for the logger channels. The logger's communication port and serial number are also displayed. The Realtime Window is useful if you have many loggers connected and want to see what each is measuring. Also, since the display is relatively large, it is useful when you want to see the measurements, but you are not sitting at your computer.

You can minimize the window by clicking on the  and close it by clicking on the  buttons in the upper right corner. If the window is minimized, an icon appears on your computer's taskbar. You can click on the icon to maximize the Realtime Window again. Note that you can operate the Realtime display even if you close the program. Simply, select Yes when asked whether you want to leave the Realtime window open after closing.



If you right-click in the Realtime Window, you can choose if you want to have the window "Always on Top". With this option selected, regardless of which application you are running, you will see the Realtime Window on the screen. If you do not choose this option, the Realtime Window will be hidden when you switch to another application. You will then need to click on the Realtime icon in the Taskbar to display the Realtime Window.

SECTION 11 Troubleshooting

11.1 **Why Can't I Open TrendReader Standard 2?**

Only one instance of TrendReader Standard 2 can be open at a time.

If you are logged into your computer and can't open TrendReader Standard 2 the computer you are using may have multiple user accounts. One of the other logged on users may have TrendReader Standard 2 open. Logon as the other user and use or close TrendReader Standard 2, you can then logon to another user account and open TrendReader Standard 2.

11.2 **Why Can't I Communicate with My Logger?**

If your logger does not respond when communication is attempted, check that:

- the logger or modem is attached to the selected COM port
- all connections are secure between the computer and the logger
- there are no other applications using the COM port
- only one serial port is hardware configured for each COM designation
- there are no conflicting IRQ assignments

If the logger still does not work try:

- testing the serial port with another application
- the software on another computer
- other loggers or interface cables

11.3**Why Can't I Contact My SmartReader Plus Network?**

If your logger does not contact your SmartReader Plus network, check that the SRP Network Logger List of the site contains the serial number of the loggers in the network.

11.4 **Why Can't I Backup My Logger?**

Check to see that the logger has a minimum of 3 readings, otherwise it will not backup as there is not enough data.

If the software cannot back up the logger's data, make sure there is enough room on the hard drive to store the data.

11.5 **How Accurate are the Time Measurements?**

There are two answers to this question. The first answer describes the relative accuracy of each reading. The second answer describes the absolute accuracy of the readings.

Relative accuracy

The relative time measurements in normal mode (the time that elapses between one reading and the next reading) are precise to within $\pm 2 * \text{sample rate} / 24 * 3600$. The accuracy of the clock inside the logger is ± 2 seconds per day.

Absolute accuracy

TrendReader Standard 2 absolute time accuracy (the difference between the time the data logger took a reading and the time that TrendReader Standard 2 reports the reading was taken) depends on the time base in the logger. The absolute time of the readings are accurate to within ± 4 seconds.

When you back up your data, the logger is unable to tell TrendReader Standard 2 precisely when it stored its last reading. TrendReader Standard 2 only knows the current time and the elapsed time in 8-seconds intervals.

11.6 What Rights are Needed to Run TrendReader Standard 2 on a Network?

The method for granting rights varies according to which network operating system is being used. You should have the following rights:

- create
- erase
- search
- modify
- read
- write

(or their equivalent) to both the TrendReader Standard 2 and the file path directory used to store data.

11.7**Why Doesn't My Printer Work?**

1. Make sure the printer is powered and online by checking that it is plugged in and the associated lights are on.
2. Check that the printer cable is connected to the appropriate port on your computer.
3. On your computer:
 - 1) Click **Start**.
 - 2) Choose **Settings, Printers**.
 - 3) If your printer is not shown in the Printer Window, click on Add Printer and follow the instructions to add your printer driver.
4. Try the printer's self-test function. If the printer fails the self-test, repair or replace your printer.

11.8 How Can I Use TrendReader Standard 2 in Another Language?

TrendReader Standard 2 is a very flexible application that you can customize to your preferred language. You can change the language for TrendReader Standard 2 by changing the operating system language.

Changing the Language

If you are using a Windows operating system in a TrendReader Standard 2 supported language TrendReader Standard 2 will run in that language.

If you are using an operating system in a language not supported by TrendReader Standard 2 or you want to use a different language other than the one for the operating system you can change it. This is done by changing the Regional language settings for the operating system. The default language is English for systems in a language not supported by TrendReader Standard 2.

Windows 2000

1. Open the Control Panel (Start -> Settings -> Control Panel) and double click on Regional Options.
2. Under the *General* tab select your locale and language setting for any of the supported languages in TrendReader Standard 2. Click on the "Set default" button and select the default language. Note that the settings may require your Windows 2000 installation disk and a restart of your machine to install the character set. Follow the Windows instructions for this procedure.
3. The chosen language will be used the next time you open TrendReader Standard 2.

Windows XP

1. Open the Control Panel (Start -> Control Panel) and double click on Regional and Language Options.
2. Under the *Regional Options* tab you can select an item under "Standards and formats" for format of numbers, date, time, etc. and your location under the "Location" section.
3. Under the *Advanced* tab select the TrendReader Standard 2 supported language under "Language for non-Unicode programs". Note that the settings may require your Windows XP installation disk and a restart of your machine to install the character set. Follow the Windows instructions for this procedure.
4. The chosen language will be used the next time you open TrendReader Standard 2.

If the TrendReader Standard 2 supported language you want to use is not available under the *Regional Options* or *Advanced* tabs you will need to install the character set under the *Advanced* tab. Under the *Advanced* tab for languages that require special characters select the "Code page conversion table" to install the character set for the language you want. Select "Apply" in "Default user account settings" and OK.

This will require your Windows XP installation disk and to restart your machine. Follow the Windows instructions for this procedure. After the restart return to this tab and select the installed language under "Language for non-Unicode programs".

Note that there may be some discrepancies if you select one language under the *Regional Options* tab and a different one under the *Advanced* tab.

11.9 **Technical Support**

If you need assistance with TrendReader Standard 2 or ACR Data Loggers, please have the following available when you call:

- description of problem or question
- access to the computer where the software is installed
- the user name, company name, and license serial number under which the software is registered
- software version number which appears on the opening window
- logger model and serial number being used
- interface cable or module part number
- this reference guide and all related material

Software operation and hardware support questions should be directed to your dealer. However, if you experience difficulty using TrendReader Standard 2 software or related products please contact ACR Systems Inc. by phone 1-800-663-7845 (North America), or email us: customerservice@acrsystems.com

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